B. AIR QUALITY

INTRODUCTON

As more fully described in the 1987 LRDP EIR, as amended, potential impacts on air quality could result from the continued operation of LBNL as well as the continued development at the Laboratory as contemplated in the 1987 LRDP.

This section discusses existing air quality conditions in the project area and the regulatory framework for air quality management, and analyzes the potential for the project to affect existing air quality conditions, both regionally and locally. It also analyzes the types and quantities of emissions that would be generated on a temporary basis due to project construction and over the long-term due to project operation.

SETTING

Air quality is affected by the rate, amount, and location of pollutant emissions and the associated meteorological conditions that influence pollutant movement and dispersal. Atmospheric conditions, including wind speed, wind direction, and air temperature, in combination with local surface topography (i.e., geographic features such as mountains and valleys), determine the effect of air pollutant emissions on local air quality.

CLIMATE AND METEOROLOGY

The project site is located in the city of Berkeley and is within the boundaries of the San Francisco Bay Area Air Basin (Bay Area). The Bay Area's moderate climate steers storm tracks away from the region for much of the year. Berkeley's proximity to the refreshing onshore breezes stimulated by the Pacific Ocean provide for generally very good air quality at LBNL. However, during the ozone smog season (summer and fall), transport studies have shown that ozone precursor emissions generated in Oakland and Berkeley are often transported to other regions of the Bay Area and beyond (e.g., Central Valley) that are more conducive to the formation of ozone smog. In the winter, reduced solar energy and cooler temperatures diminish ozone smog formation, but increase the likelihood of carbon monoxide formation.

Temperature in Berkeley averages 57^{o}F annually, ranging from an average of 44^{o}F on winter mornings to 70^{o}F in the late summer afternoons. Daily and seasonal oscillations of temperature are small because of the moderating effects of the nearby ocean. In contrast to the steady temperature regime, rainfall is highly variable and confined almost exclusively to the "rainy" period from early November to mid-April. Berkeley averages 24 inches of precipitation annually (Western Regional Climate Center [WRCC], 2001), but because much of the area's rainfall is derived from the fringes of mid-latitude storms, a shift in the annual storm track of a few hundred miles can mean the difference between a very wet year and near drought conditions. Winds in the Berkeley area display several characteristic regimes. During the day, especially under fair weather conditions, winds are from the west and northwest as air is funneled through the Golden

Gate towards the Laboratory. At night, cooling of the land generates winds from the east and southeast. Southeast winds typically also precede weather systems passing through the region.

REGULATORY CONTEXT

CRITERIA AIR POLLUTANTS

The federal Clean Air Act of 1970 established maximum allowable concentration standards for six ambient air pollutants known as "criteria" pollutants - ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, respirable particulate matter (PM-10) and lead. These ambient air quality standards are shown in Table IV.B-1. This table also presents federal and states ambient air quality standards for each pollutant and provides a brief discussion of their related health effects and principal sources. Each of these standards was set to meet specific public health and welfare criteria. Individual states were given the option to adopt more stringent state standards for criteria pollutants and to include other pollutants. California has done so with these and other pollutants through the California Clean Air Act.

Both the federal and California Clean Air Acts also require that air basins or portions thereof, be classified as either "attainment" or "nonattainment" for each criteria air pollutant, based on whether or not the federal and state standards have been achieved. Nonattainment areas are required to prepare air quality plans that include strategies for achieving attainment and maintenance plans are required for attainment areas that had previously been designated nonattainment in order to ensure the continued maintenance of the standards. Air quality plans developed to meet federal requirements are referred to as State Implementation Plans (SIPs). Air quality plans are required to address all nonattainment issues except the state PM-10 standard.

REGULATORY AGENCIES

The U.S. Environmental Protection Agency (EPA) is responsible for implementing the myriad programs established under the federal Clean Air Act, such as establishing and reviewing the federal ambient air quality standards and judging the adequacy of State Implementation Plans, but has delegated the authority to implement many of the federal programs to the states while retaining an oversight role to ensure that the programs continue to be implemented. The Air Resources Board, California's air quality management agency, is responsible for establishing and reviewing the state ambient air quality standards, compiling the California State Implementation Plan and securing approval of that plan from U.S. EPA, and identifying toxic air contaminants. The Air Resources Board also regulates mobile emissions sources in California, such as construction equipment, trucks, and automobiles, and oversees the activities of air quality management districts, which are organized at the county or regional level. The county or regional air quality management districts are primarily responsible for regulating stationary emissions sources at industrial and commercial facilities within their geographic areas and for preparing the air quality plans that are required under the federal Clean Air Act and California Clean Air Act. The Bay Area Air Quality Management District (BAAQMD) is the regional agency with regulatory authority over stationary sources in the Bay Area. The BAAQMD has the primary responsibility to meet and maintain the state and federal ambient air quality standards in the Bay Area.

TABLE IV.B-1
STATE AND FEDERAL CRITERIA AIR POLLUTANT STANDARDS, EFFECTS AND SOURCES

Pollutant	Averaging Time	State Standard	Federal Standard	Pollutant Health and Atmospheric Effects	Major Pollutant Sources
Ozone	1 hour 8 hours	0.09 ppm ---	0.12 ppm 0.08 ppm	High concentrations can directly affect lungs, causing irritation. Long-term exposure may cause damage to lung tissue.	Formed when reactive organic gases (ROG) and nitrogen oxides (NO_X) react in the presence of sunlight. Major sources include on-road motor vehicles, solvent evaporation, and commercial / industrial mobile equipment.
Carbon Monoxide	1 hour 8 hours	20 ppm 9 ppm	35 ppm 9 ppm	Classified as a chemical asphyxiant, carbon monoxide interferes with the transfer of fresh oxygen to the blood and deprives sensitive tissues of oxygen.	Internal combustion engines, primarily gasoline-powered motor vehicles.
Nitrogen Dioxide	1 hour Annual Avg.	0.25 ppm ---	--- 0.053 ppm	Irritating to eyes and respiratory tract. Colors atmosphere reddish-brown.	Motor vehicles, petroleum refining operations, industrial sources, aircraft, ships, and railroads.
Sulfur Dioxide	1 hour 3 hours 24 hours Annual Avg.	0.25 ppm --- 0.04 ppm ---	--- 0.5 ppm 0.14 ppm 0.03 ppm	Irritates upper respiratory tract; injurious to lung tissue. Can yellow the leaves of plants, destructive to marble, iron, and steel. Limits visibility and reduces sunlight.	Fuel combustion, chemical plants, sulfur recovery plants, and metal processing.
Respirable Particulate Matter (PM-10)	24 hours Annual Avg.	50 $\mu g/m^3$ 20 $\mu g/m^3$	150 $\mu g/m^3$ 50 $\mu g/m^3$	May irritate eyes and respiratory tract, decreases in lung capacity, cancer and increased mortality. Produces haze and limits visibility.	Dust and fume-producing industrial and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g. wind-raised dust and ocean sprays).
Fine Particulate Matter (PM-2.5)	24 hours Annual Avg.	--- 12 $\mu g/m^3$	65 $\mu g/m^3$ 15 $\mu g/m^3$	Increases respiratory disease, lung damage, cancer, and premature death. Reduces visibility and results in surface soiling.	Fuel combustion in motor vehicles, equipment, and industrial sources; residential and agricultural burning; Also, formed from photochemical reactions of other pollutants, including NO_X, sulfur oxides, and organics.
Lead	Monthly Ave. Quarterly	1.5 $\mu g/m^3$ ---	--- 1.5 $\mu g/m^3$	Disturbs gastrointestinal system, and causes anemia, kidney disease, and neuromuscular and neurologic dysfunction.	Present source: lead smelters, battery manufacturing & recycling facilities. Past source: combustion of leaded gasoline.

NOTE: ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter.

SOURCE: California Air Resources Board, Available at *http://www.arb.ca.gov/aqs/aaqs2.pdf*, June 12, 2003.

AIR QUALITY PLANS, POLICIES AND REGULATIONS

Plans and Policies

The Bay Area Air Basin is currently designated nonattainment for state ozone standards and the federal one-hour ozone standard, though ozone levels measured at monitoring stations in the Berkeley and Oakland area do not exceed either standard. Ozone and ozone precursors such as reactive organic compounds and oxides of nitrogen are the pollutants of greatest concern in the Bay Area. The Bay Area also is designated as nonattainment for the state PM-10 standard. Urbanized portions of the Bay Area (specifically referred to as the San Francisco - Oakland - San Jose federal planning area) are designated "maintenance" with respect to the federal carbon monoxide standard. The "maintenance" designation denotes that the area, now "attainment," had once been designated as "nonattainment." The Bay Area is designated as either attainment or unclassified with respect to all other pollutants.

As required by state and federal laws, there are three plans for the Bay Area Air Basin developed in part by BAAQMD to meet federal and state air quality planning. They are:

- *Ozone Attainment Plan for the 1-Hour National Ozone Standard* (Association of Bay Area Governments (ABAG), 2001) developed to meet federal ozone air quality planning requirements;

- *Bay Area 2000 Clean Air Plan* (BAAQMD, 2000), the most recent triennial update of the *1991 Clean Air Plan* developed to meet planning requirements related to the state ozone standard; and

- The 1996 Carbon Monoxide Redesignation Request and Maintenance Plan for Ten Federal Planning Areas, developed by the air districts with jurisdiction over the ten planning areas including the BAAQMD to ensure continued attainment of the federal carbon monoxide standard. In June 1998, the U.S. EPA approved this plan and designated the ten areas to attainment. The maintenance plan was revised in October 1998.

BAAQMD Rules and Regulations

BAAQMD exercises permit authority through its *Rules and Regulations*. Both federal and state ozone plans rely heavily upon stationary source control measures set forth in BAAQMD's *Rules and Regulations.*

City of Berkeley General Plan

The City of Berkeley General Plan's policy T-20 encourages innovative technologies and programs, such as clean fuel, electric and low-emission cars that reduce the air quality impacts of automobiles.

EXISTING AIR QUALITY

The BAAQMD operates a regional monitoring network that measures the ambient concentrations of the six criteria pollutants. Existing and probable future levels of air quality in Berkeley can generally be inferred from ambient air quality measurements conducted by the BAAQMD at its monitoring stations. There are no BAAQMD monitoring stations in Berkeley. The Alice Street station in Oakland is nearest to the project site (located approximately 4 miles to the southwest) and is considered to be representative of the air quality in the vicinity of LBNL. This station monitors ozone and carbon monoxide. The nearest station that monitors PM-10 is located at Chapel Way in Fremont, approximately 30 miles southeast of the project site. Since particulate matter is a local pollutant, data from the Chapel Way station cannot be considered to be representative of particulate matter concentrations in the project area. Table IV.B-2 shows a five-year summary of monitoring data for ozone and carbon monoxide from the Alice Street station. Table IV.B-2 also compares measured pollutant concentrations with state and federal ambient air quality standards. Table IV.B-3 shows trends in regional exceedances of the federal and state ozone standards. Because of the exceedances, ozone is the pollutant of greatest concern in the Bay Area. Bay Area counties experience most ozone exceedances during the period from April through October.

Ozone

Ozone is a respiratory irritant and an oxidant that increases susceptibility to respiratory infections. It also can cause substantial damage to vegetation and other materials. Ozone is not emitted directly into the atmosphere, but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and nitrogen oxides (NO_x). ROG and NO_x are known as precursor compounds for ozone. Substantial ozone production generally requires ozone precursors to be present in a stable atmosphere with strong sunlight for approximately three hours. Ozone is therefore considered a regional air pollutant, in that it is not emitted directly by sources, but is formed downwind of sources of ROG and NO_x under the influence of wind and sunlight. Ozone concentrations tend to be higher in the late spring, summer, and fall, when the long sunny days combine with regional subsidence inversions to create conditions conducive to the formation and accumulation of secondary photochemical compounds, like ozone.

Based on the data shown in Table IV.B-2, there have been no exceedances of the state and the federal one-hour ozone standards in the project vicinity over the last four years. Region-wide, ROG and NO_x emissions are expected to decrease by approximately 26 and 28 percent respectively from 2001 to 2010 (CARB, 2002).

Carbon Monoxide

Carbon monoxide is a non-reactive pollutant that is a product of incomplete combustion and is mostly associated with motor vehicle traffic. High carbon monoxide concentrations develop primarily during winter when periods of light winds combine with the formation of ground level temperature inversions (typically from the evening through early morning). These conditions

TABLE IV.B-2
AIR QUALITY DATA SUMMARY (1998-2002) FOR THE PROJECT AREA

Pollutant	Standard[b]	Monitoring Data by Year[a] 1998	1999	2000	2001	2002
Ozone:						
Highest 1 Hour Average (ppm) [c]		0.06	0.08	0.07	0.07	0.05
Days over State Standard	0.09	0	0	0	0	0
Days over Federal Standard	0.12	0	0	0	0	0
Highest 8 Hour Average (ppm) [c]	0.08	0.05	0.06	0.05	0.04	0.04
Days over Federal Standard		0	0	0	0	0
Carbon Monoxide:						
Highest 8 Hour Average (ppm) [c]		4.6	5.2	3.4	4.0	3.3
Days over State/Federal Standard	9.0	0	0	0	0	0

[a] Data are from the Alice Street station in Oakland.
[b] Generally, state standards are not to be exceeded and federal standards are not to be exceeded more than once per year.
[c] ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter.

NOTE: Values in **bold** are in excess of applicable standard.

SOURCE: California Air Resources Board, *Summaries of Air Quality Data*, 1998, 1999, 2000, 2001, 2002; http://www.arb.ca.gov/adam.

result in reduced dispersion of vehicle emissions. Motor vehicles also exhibit increased carbon monoxide emission rates at low air temperatures. When inhaled at high concentrations, carbon monoxide combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart, and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease or anemia.

Table IV.B-2 shows that there have been no exceedances of state and federal ambient carbon monoxide standards at the Alice Street station in Oakland in the last five years. Based on BAAQMD carbon monoxide isopleth maps, background carbon monoxide concentrations in the project vicinity are approximately 5 parts per million, one-hour average, and 3 parts per million, eight-hour average (BAAQMD, 1999). On-road motor vehicles are responsible for approximately 75 percent of the carbon monoxide emitted within the San Francisco Bay Area and 80 percent of the emissions in Alameda County (CARB, 2002). Carbon monoxide emissions are expected to decrease within the county by approximately 40 percent between 2001 and 2010 (CARB, 2002).

TABLE IV.B-3
SUMMARY OF OZONE DATA FOR THE
SAN FRANCISCO BAY AREA AIR BASIN, 1990–2001

Year	Number of Days Standard Exceeded[a]			Ozone Concentrations in ppm[b]	
	State 1 hr	Federal 1 hr	Federal 8 hr	Maximum 1 hr	Maximum 8 hr
2001	15	1	7	0.13	0.100
2000	12	3	9	0.15	0.144
1999	20	3	4	0.16	0.122
1998	29	8	16	0.15	0.111
1997	8	0	0	0.11	0.084
1996	34	8	14	0.14	0.112
1995	28	11	18	0.16	0.115
1994	13	2	4	0.13	0.097
1993	19	3	5	0.13	0.112
1992	23	2	6	0.13	0.101
1991	23	2	6	0.14	0.108
1990	14	2	7	0.13	0.105

[a] This table summarizes the data from all of the monitoring stations within the Bay Area.
[b] ppm = parts per million.

SOURCE: California Air Resources Board web site at http://www.arb.ca.gov/aqd/y2d_oz/d_y2doz.htm, October 31, 2001.

Particulate Matter

PM-10 and PM-2.5 consist of particulate matter that is 10 microns or less in diameter and 2.5 microns or less in diameter, respectively. (A micron is one-millionth of a meter, or less than one-25,000th of an inch. For comparison, human hair is 50 or more microns in diameter.) PM-10 and PM-2.5 represent fractions of particulate matter that can be inhaled into the air passages and the lungs and can cause adverse health effects. Particulate matter in the atmosphere results from many kinds of dust- and fume-producing industrial and agricultural operations, fuel combustion, and atmospheric photochemical reactions. Some sources of particulate matter, such as demolition and construction activities, are more local in nature, while others, such as vehicular traffic, have a more regional effect. Very small particles of certain substances (e.g., sulfates and nitrates) can cause lung damage directly, or can contain adsorbed gases (e.g., chlorides or ammonium) that may be injurious to health. Particulates also can damage materials and reduce visibility.

PM-10 is monitored only in Fremont and Livermore in Alameda County, and therefore no PM-10 data are available from the Alice Street to track trends in PM-10 concentration in the project area. Data from the Rumrill Boulevard station in San Pablo (Contra Costa County) indicate that there

were an estimated 18 exceedances of the state 24-hour standard in 2002, and no exceedances of the national 24-hour standard. At the other San Pablo station, on El Portal, there were no exceedances of either the state or national 24-hour standards in 2002 (neither of these sites has monitoring data prior to 2002). Generally, contributors to PM-10 concentrations in the project area are primarily urban sources, dust suspended by vehicle traffic, and secondary aerosols formed by reactions in the atmosphere. Particulate concentrations near residential sources generally are higher during the winter, when more fireplaces are in use and meteorological conditions prevent the dispersion of directly emitted contaminants. Direct PM-10 emissions in Alameda County are expected to increase by approximately 10 percent between 2001 and 2010. This increase would be primarily from stationary sources (such as industrial activities) and area sources (such as construction and demolition, road dust and other miscellaneous processes).

The California Air Resources Board along with the local air districts began monitoring PM-2.5 concentrations in 1999. Based on 4 years on monitoring data, as of January 2003, the Bay Area was designated as a nonattainment area for the state PM-2.5 standard. However, the Bay Area remains unclassified with respect to the national PM-2.5 standards. The state and local air quality agencies are awaiting regulatory guidance from the U.S. EPA on attainment and planning issues related to the federal PM-2.5 standards. Also, there is no state attainment plan for PM-2.5 developed since state law does not require attainment plans for particulate matter.

Other Criteria Pollutants

The standards for NO_2, SO_2, and lead are being met in the Bay Area, and the latest pollutant trends suggest that these standards will not be exceeded in the foreseeable future (ABAG, 2001).

SENSITIVE RECEPTORS

Some receptors are considered more sensitive than others to air pollutants. The reasons for greater than average sensitivity include pre-existing health problems, proximity to emissions source, or duration of exposure to air pollutants. Schools, hospitals and convalescent homes are considered to be relatively sensitive to poor air quality because children, elderly people and the infirm are more susceptible to respiratory distress and other air quality-related health problems than the general public. Residential areas are also sensitive to poor air quality because people usually stay home for extended periods of time, with associated greater exposure to ambient air quality. Recreational uses are also considered sensitive due to the greater exposure to ambient air quality conditions because vigorous exercise associated with recreation places a high demand on the human respiratory system.

Sensitive receptors in the vicinity of the project site include areas of residential and nearby dormitories associated with the University. The nearest sensitive receptors are the multi-family residences located to the south of the site along Highland Place and the Foothill student dormitories of UC Berkeley located to the southeast of the site along Cyclotron Road.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The 1987 LRDP EIR, as amended, used significance thresholds established by the BAAQMD that were current at the time of the last amendments to the LRDP (1992 and 1997).

In the "BAAQMD CEQA Guidelines," the BAAQMD (1999) provides various thresholds and tests of significance. For ROG, NO_x and PM-10, a net increase of 80 pounds per day is considered significant, while for CO, an increase of 550 pounds per day is used as a screening threshold to determine if it leads to a possible local violation of the carbon monoxide standards (i.e., if it creates a "hot spot"). Generally, if a project results in an increase in ROG, NO_x, or PM-10, of more than 80 pounds per day, then it would also be considered to contribute substantially to the significant cumulative effect. For projects that would not lead to a significant increase of ROG, NO_x, or PM-10 emissions individually, the cumulative effect is evaluated based on a determination of the consistency of the project with the regional Clean Air Plan. Generally, a project that is consistent with the applicable General Plan, such as the proposed project, would not contribute in a significant manner to the cumulative regional effect if the applicable General Plan itself were consistent with the Clean Air Plan. To be consistent with the Clean Air Plan, a General Plan must be based on population projections that are consistent with those used in developing the Clean Air Plan and must provide for a rate of increase in vehicle miles traveled (VMT) that does exceed the rate of increase in population.

The impact of an LBNL project on air quality would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the state CEQA *Guidelines* and the UC CEQA Handbook:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors);
- Expose sensitive receptors to substantial pollutant concentration;
- Create objectionable odors affecting a substantial number of people; and,
- Exceed an applicable LRDP or Program EIR standard of significance.

The following relevant impacts to air quality were anticipated and analyzed pursuant to CEQA, as part of the programmatic 1987 LRDP EIR, as amended, from which this analysis is tiered:

Impact III-J-1:	Construction of new facilities projected in the 1987 LRDP would generate short-term emissions of air pollutants.

Impact III-J-2:	The proposed project at LBNL would generate long-term emissions of criteria air pollutants.
Cumulative Impacts:	Projects developed in the San Francisco Bay Area are expected to result in increased vehicle trips and increased emissions of pollutants from stationary and mobile sources that contribute to the Bay Area's non-attainment status.

As a result of anticipated impacts to air quality, the following mitigation measures, adopted as part of the 1987 LRDP EIR, as amended, are already required for the proposed project, and are therefore incorporated as part of the proposed project's description:

Mitigation Measure III-J-1:	Construction contract specifications would require that during construction exposed surfaces would be wetted twice daily or as needed to reduce dust emissions. In addition, contract specifications would require covering of excavated materials.[7]
Mitigation Measure III-J-2:	LBNL will design building ventilation systems to minimize emission of criteria air pollutants following compliance with all applicable regulatory requirements (e.g., NSR [new source review]). Although this impact was not found to have exceeded the BAAQMD's threshold for significance, the 1987 LRDP EIR, as amended, conservatively identified this impact as not fully mitigated by Mitigation Measure III-J-2 "for the purposes of this SEIR."
Cumulative Impacts:	The 1987 LRDP EIR, as amended, found that LBNL would comply with applicable transportation management and emission control measures imposed by the BAAQMD pursuant to the then-current 1991 Clean Air Plan and the California Clean Air Act. As these regional measures were to be adopted by the BAAQMD to attain ambient air quality standards in the San Francisco Bay Area Air Basin, these measures were not within the jurisdiction of the Regents to implement. Therefore, the cumulative air quality impacts of regional growth were considered to be significant and unavoidable for the purposes of the LRDP EIR, as amended. The 1987 LRDP EIR, as amended, also found that mitigation measures that would serve to minimize impacts related to toxic air contaminants would serve to reduce the LRDP's contribution to cumulative air pollutant levels. However, any regional measures intended to reduce toxic air contaminants were not within the jurisdiction of LBNL's management to implement. Therefore, the cumulative air quality impacts of toxic air contaminant emission increases

[7] Current LBNL specifications require that contractors comply with all BAAQMD Rules and Regulations such as, for example, the use of acceptable solvent-based products such as coatings and sealants.

due to regional growth and development remained significant and unavoidable.

In 1992, The Regents of the University of California adopted a Statement of Overriding Considerations for this unavoidable, significant cumulative impact. The 1997 Addendum to the 1992 SEIR found that criteria pollutant and TAC emissions associated with development at LBNL under the LRDP through the LRDP's horizon year would not cause emissions substantially more severe than those analyzed in the 1992 SEIR because emissions would remain below the SEIR standards of significance.

EXCAVATION, GRADING AND CONSTRUCTION IMPACTS

Impact B.1: Project-related construction activities would generate short-term emissions of criteria pollutants, including suspended and inhalable particulate matter and equipment exhaust emissions. (Significant)

Excavation, grading, and construction activities would create a short-term adverse effect on the local air quality of the site and its surroundings. These activities have the potential to generate substantial amounts of dust (including PM-10 and PM-2.5) primarily from "fugitive" sources (i.e., emissions released through means other than through a stack or tailpipe) and lesser amounts of other criteria air pollutants primarily from operation of heavy equipment construction machinery (primarily diesel operated) and construction worker automobile trips (primarily gasoline operated).

As stated in the *Project Description*, the proposed Building 49 would be constructed by cutting and filling up to about 26,000 cubic yards of soil; construction would take place over a period of 18 months from Spring 2004 to Fall 2005, while excavation would occur for approximately a three-month period. The project would require extensive site preparation that includes excavation, soil compaction, and grading. Any building foundation piers would be drilled rather than driven. With the exception of utility extensions to service the building, no utility relocations are anticipated. Construction-related dust emissions would vary from day to day, depending on the level and type of activity, silt content of the soil, and meteorological conditions. In the absence of mitigation, construction activities may result in significant quantities of dust, and as a result, local visibility and PM-10 concentrations may be adversely affected on a temporary and intermittent basis during the construction period. In addition, the fugitive dust generated by construction would include not only PM-10, but also larger particles, which would fall out of the atmosphere within several hundred feet of the site and could result in nuisance-type impacts. The BAAQMD's approach to analyses of construction impacts is to emphasize implementation of effective and comprehensive control measures rather than detailed quantification of emissions. The District considers any project's construction-related impacts to be less than significant if the required dust-control measures are implemented. The 1987 LRDP EIR, as amended, anticipates construction-related air quality impacts as the result of Lab development (Impact III-J-1) and stipulates that dust control measures be included as part of all new projects (Mitigation

Measure III-J-1). Compliance of the project with the 1987 LRDP EIR, as amended, Mitigation Measure III-J-1, as discussed above, would reduce the project's construction-related air quality impacts. In addition, the "BAAQMD CEQA Guidelines" require that construction projects less than 4 acres in size, such as the Building 49 project, implement basic dust control program which include dust control measures in addition to those identified in Mitigation Measure III-J-1 of the 1987 LRDP EIR, as amended. These basic dust control measures are listed in Mitigation Measure B-1 below. Compliance with these measures would ensure that project construction would not lead to violation of any air quality standard or contribute substantially to an existing or projected regional air quality exceedance.

Construction activities would primarily generate particulate matter in the form of fugitive dust. Project construction would also generate ozone precursors and carbon monoxide emissions from the operation of construction equipment and the use of certain solvent-based materials at various stages of construction. Equipment used would be standard diesel-powered loaders, excavators, bulldozers, and trucks. Trucks would arrive on-site delivering building materials and concrete for foundations, and dump trucks would travel to and from the site during the excavation period to remove excavated soil. Building construction might involve compressors, pneumatic equipment such as drills and nut drivers, cranes, forklifts, and other equipment. A rotary drill rig, likely powered by diesel engines, would bore holes for drilled piers as part of the foundation. The BAAQMD does not require quantification of construction emissions and has not established thresholds for construction emissions. Emissions from the operation of this equipment are considered to be less than significant, as these emissions have already been accounted for in the preparation of the air quality plans.

Mitigation Measure B.1: During construction, the project sponsor shall require the construction contractor to implement BAAQMD's basic dust control procedures required for sites smaller than four acres, such as the project site, to maintain project construction-related impacts at acceptable levels; this mitigates the potential impact to less than significant. Elements of the dust abatement program shall include, but not be limited to the following:

- Water all active construction areas at least twice daily, or as needed to sufficiently reduce dust emissions. Watering should be sufficient to prevent airborne dust from leaving the site. Increased watering frequency may be necessary whenever wind speeds exceed 15 miles per hour. Reclaimed water should be used whenever possible (included in Mitigation Measure III-J.1 of the 1987 LRDP EIR, as amended).

- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard (i.e., the minimum required space between the top of the load and the top of the trailer) (included in Mitigation Measure III-J.1 of the 1987 LRDP EIR, as amended).

- Pave, apply water three times daily, or as needed to sufficiently reduce dust emissions, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.

- Sweep streets (with water sweepers using reclaimed water if possible) at the end of each day if visible soil material is carried onto adjacent paved roads.

Significance after Mitigation: Less than Significant.

PROJECT OPERATIONAL IMPACTS

Impact B.2: The project could result in an increase in criteria pollutant emissions. (Less than Significant)

Once operational, the project would not result in an increase in motor vehicle trips. This is because Building 49 would accommodate existing employees at the LBNL site and would not lead to an increase in the number of employees or visitors to the lab. The project would result in a minimal increase in emissions from area sources such as natural gas combustion for space and water heating, landscaping, etc. The project would also create increased electric energy demand from air conditioning and heating equipment. Electricity demand requires more fossil fuel combustion at regional power plants. This would not affect the immediate area but would also add to the regional pollutant burden of ozone precursors, particularly oxides of nitrogen. The building would not house any laboratories; hence, no additional emissions are expected to be generated at the building. The increase in emissions from area sources at the building would be minimal and the total emissions would be well below the 80 pounds per day threshold recommended by the BAAQMD for ROG, NOx and PM-10.

In addition, air impacts due to LBNL operational activities consistent with LRDP growth projections were analyzed in the 1987 LRDP EIR, as amended; the proposed Building 49 project is consistent with the 1987 LRDP and the 1987 LRDP EIR, as amended, and is covered under that analysis. Therefore, this would be a less-than-significant impact.

Mitigation: None required.

CUMULATIVE IMPACTS

Impact B.3: The project would not result in a cumulatively considerable contribution to regional air quality impacts. (Less than Significant)

As noted in Impact B.2, the project alone would result in a less than significant air quality impact. The 1987 LRDP EIR, as amended, identified a significant, unavoidable cumulative impact, in that "Regional growth and development will continue to impact the current exceedances of air quality standards. Projects developed in the San Francisco Bay Area are expected to result in increased vehicle trips and increased emissions of pollutants from stationary and mobile sources that contribute to the Bay Area's non-attainment status" (LBNL, 1992; pp. III-J-45 – III-J-46). The

SEIR concluded that the impact would be unavoidable because, while the BAAQMD would adopt emission-control strategies, implementation of these strategies would be outside the jurisdiction of LBNL. The Regents of the University of California adopted a Statement of Overriding Considerations in 1992 for this unavoidable, significant impact.

According to the state CEQA *Guidelines*, "Where a lead agency is examining a project with an incremental effect that is not 'cumulatively considerable,' a lead agency need not consider that effect significant, but shall briefly describe its basis for concluding that the incremental effect is not cumulatively considerable" (*Guidelines*, Sec. 15130(a)). "'Cumulatively considerable' means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects as defined in Section 15130" (*Guidelines*, Sec. 15065(c)). Because the project would effectively generate little or no new traffic, and therefore would result in little or no increase in emissions of ozone precursors or particulate matter (other than during construction, which is analyzed separately and determined to be less than significant, with mitigation, under Impact B-1), the project's increment of emissions of criteria pollutants for which the Bay Area is nonattainment would be effectively zero, and therefore the cumulative impact would not be significant.

Mitigation: None required.

SUMMARY OF IMPACTS AND MITIGATION MEASURES

As noted in the discussion above, under the 1987 LRDP EIR, as amended, with the incorporation of the proposed Mitigation Measures, the proposed project would not exceed the Standards of Significance established for environmental effects related to Air Quality.

The proposed project would incorporate 1987 LRDP EIR, as amended, Mitigation Measures III-J-1 and III-J-2.

Potentially significant impacts not mitigated by the 1987 LRDP EIR, as amended: Building 49 project-specific Mitigation Measure B.1 has been added to fully mitigate potential air quality impacts resulting from project construction. As a result, no significant air quality impacts would result from the proposed project.

Building 49 Project-Specific Mitigation Measures: See Mitigation Measure B.1 presented above.

C. BIOLOGICAL RESOURCES

INTRODUCTION

This section discusses existing biological resources at the project site and analyzes the potential for the project to affect those resources. Information for the discussion and subsequent analysis was drawn from site visits (ESA, 2002; ESA, 2002b; ESA, 2003); biological data presented in the California Department of Fish and Game Natural Diversity Data Base (CNDDB)[8] and the California Native Plant Society's (CNPS) *Electronic Inventory of Rare and Endangered Vascular Plants of California*, standard biological references (Skinner and Pavlik, 1994; Hickman, 1993; Zeiner et al., 1990; Stebbins, 1985); local historical and current information on the project area's biological resources from a variety of sources; LBNL's LRDP, and environmental impact reports for the LDRP, as amended, and previous LBNL projects. Potential effects of the proposed project on sensitive species and habitats are identified and mitigation measures are proposed to reduce those impacts to less than significant.

SETTING

REGIONAL SETTING

The project site is located in the San Francisco Bay Area, which is characterized by a Mediterranean climate. More specifically LBNL is situated on 200 acres on the western slopes of the Oakland-Berkeley Hills, where low to moderate density residential neighborhoods are mixed with open space containing a mosaic of vegetation types and wildlife habitats, including oak and mixed evergreen forests, native and non-native grasslands, chaparral, coastal scrub, marsh and wetland communities, and riparian scrubs and forests. LBNL is located within one mile of several large tracts of relatively undeveloped open space and preserved land, including Tilden Regional Park and Claremont Canyon Regional Preserve. These lands are contiguous to the south and east with undeveloped watershed lands owned by EBMUD and with Sibley Regional Volcanic Preserve and Redwood Regional Park. To the west and southwest of the site is the UC Berkeley campus, characterized by a variety of buildings, open space, student parking areas, and mature landscaping. Also to the west and northwest of the site are residential neighborhoods and a small commercial area located in the City of Berkeley.

PROJECT SITE

The proposed Building 49 site is located on an undeveloped slope, east of Cyclotron Road, and immediately northeast of LBNL's Blackberry Canyon entrance. The site slopes steeply down from east to west, as well as from north to south. A wooden stairway connecting Cyclotron Road with East Road delineates the southernmost perimeter of the Building 49 site (see photos in Figure IV.A-2). The Building 49 site supports a mixed grassland, consisting of native and non-native grasses, as well as 22 eucalyptus (*Eucalyptus globulus*) trees, 8 coast live oak (*Quercus*

[8] The CNDDB is a computer data base of the location and distribution of animals and plants that are rare, threatened, endangered or candidate species, or habitat considered to be of high quality or of limited distribution.

agrifolia), and one California bay (*Umbellularia californica*). Vegetation on the site is managed on an annual basis, either by goats or mechanical means. Wildlife observed at this site during field surveys (ESA 2002a; ESA 2002b; ESA 2003) includes common species tolerant of human presence black-tailed deer (*Odocoileus hemionus*), California towhee (*Pipilo crissalis*), chestnut-backed chickadee (*Poecile rufescens*), and western scrub jay (*Aphelocoma coerulescens*).

Plant Communities and Wildlife Habitat

Vegetation communities are assemblages of plant species that occur together in the same area and are defined by species composition and relative abundance. The vegetation/habitat classification system for this project is based on Sawyer and Keeler-Wolf (1995) and influenced by the classification system of Holland (1986). Vegetation series generally correlate with wildlife habitat types. Wildlife habitats were classified and evaluated using the California Department of Fish and Game's (CDFG) A Guide to Wildlife Habitats of California (Mayer and Laudenslayer, 1988). The CNDDB lists several sensitive natural communities as occurring in the United States Geological Survey (USGS) quadrangles searched, including northern maritime chaparral, serpentine bunchgrass, and valley needlegrass grassland. However, none of these communities occurs on or in the vicinity of the project site. Please see Figure IV.C-1 for the locations of the plant communities that occur on the Building 49 site.

Mixed Grassland

Approximately half of the 1.08-acre Building 49 site supports a mixed grassland community. Where this vegetation type occurs beneath eucalyptus, it consists primarily of non-native grasses and other ruderal[9] species, including wild oat (*Avena sativa*), ripgut brome (*Bromus diandrus*), bristly ox-tongue (*Picris echioides*), and Italian thistle (*Carduus pycnocephalus*). Steeper portions of the site, including the road cuts along Cyclotron Road and areas not directly under the eucalyptus, support a mix of non-natives and native grasses and herbaceous species, including purple needlegrass (*Nasella pulchra*), blue wild-rye (*Elymus glaucus*), mugwort (*Artemisia douglasiana*), and cudweed (*Gnaphalium* sp.).

Grasslands in the project area may provide habitat for reptiles and amphibians such as western fence lizard (*Sceloporus occidentalis*), northern alligator lizard (*Elgaria coerulea*), and California slender salamander (*Batrachoseps attenuatus*), and birds including mourning dove (*Zenaida macroura*) and golden-crowned sparrow. Mammals such as Botta's pocket gopher (*Thomomys bottae*), California ground squirrel (*Spermophilus beecheyi*), and striped skunk (*Mephitis mephitis*) may browse and forage within the grassland and thrive when varied natural habitats are available nearby. Small rodents attract raptors, many of them special status including red-tailed hawk (*Buteo jamaicensis*).

[9] **Ruderal** species are those that are common in disturbed areas.

Mixed Grassland
Coast Live Oak Stands
Eucalyptus Grove

SOURCE: Environmental Science Associates

Figure IV.C-1
Vegetation Map

Eucalyptus Grove

Some 20 blue gum eucalyptus (*Eucalyptus globulus*) are scattered throughout the Building 49 site. Beginning in the late 1800s this non-native species was planted widely throughout the Oakland-Berkeley Hills. Understory vegetation is sparse and consists primarily of non-native weedy species, including Italian thistle (*Carduus pycnocephalus*), bristly ox-tongue (*Picris echiodes*), and a variety of grasses, including wild oat (Avena sp.) and zorro grass (*Vulpia myuros*). Mature eucalyptus groves provide nesting habitat for a number of raptors, including red-tailed hawks, red-shouldered hawks (*Buteo lineatus*), and great horned owls (*Bubo virginianus*). Eucalyptus may also provide roosting and nursery sites for several bat species, including fringed myotis and long eared myotis.

Landscaped Areas

Landscaped areas occur throughout the LBNL area, and are primarily confined to areas adjacent to buildings. Plants occurring in these areas are often common horticultural species. Landscaping installed since the LRDP was written in 1987 consists of drought-tolerant species, including a mix of non-native and native plants. Landscaped areas can provide foraging and nesting habitat for a variety of bird species, especially those that are tolerant of disturbance and human presence. Birds commonly found in such areas include the non-native English sparrow (*Passer domesticus*), house finch (*Carpodacus mexicanus*), dark-eyed junco (*Junco hyemalis*), and Anna's hummingbird. Reptiles using this type of habitat may include garter snake (*Thamnophis* sp.) and western fence lizard.

Special Status Species

For the purposes of this EIR, the term "special status species" includes those that are listed and receive specific protection defined in federal or state endangered species legislation. The term also includes other species that have not been formally listed as threatened or endangered, but have been designated as "rare" or "sensitive" on the basis of adopted policies and expertise of state resource agencies or organizations with acknowledged expertise, or policies adopted by local agencies such as counties, cities, and special districts to meet local conservation objectives. These species are referred to collectively as "special-status species" following a convention that has developed in practice but has no official sanction. Special-status species in the project area are protected by the legislation and policies discussed in the *Regulatory Setting* section below.

A list of special-status plant and animal species reported to occur in the vicinity of the project site was compiled on the basis of data in the California Natural Diversity Data Base (CNDDB, 2003), the California Native Plant Society *Electronic Inventory* (CNPS 2003), special-status species information from the U.S. Fish and Wildlife Service (USFWS, 2003), and biological literature of the region. The special-status species list presented in Table IV.C-1 is intended to be comprehensive and includes species for whom potential habitat (i.e. general habitat types) occurs within or in the vicinity of the project site. With the exception of Cooper's hawk and red-tailed hawk, no special-status plants or wildlife were identified on the project sites during surveys (ESA, 2002a; ESA 2002b; ESA 2003).

Impact Determination

Potential impacts of the project on special status species were assessed based on the literature review, professional judgment, and the following criteria:

1) A determination of susceptibility. This determination is a three-level process that evaluated for each species: a) potential occurrence in the study area (generally, the terrestrial and aquatic habitats of the project site); b) potential occurrence within the project footprint; or, c) absence from either the study area or proposed construction sites. If the species was determined unlikely to be found in the study area, for example, if no potential habitat was found to exist for the species in the project vicinity, then the species was given no further consideration.

2) If a species was determined to have the potential to occur in the project study area, further analyses were made of life history and habitat requirements, as well as the suitability of habitat found within the project site or its vicinity for the species. The results of this determination for each species are provided in the Potential to Occur column of Table IV.C-1

3) If suitable habitat was determined present within the proposed project vicinity and the species has been documented as observed within the project area or has at least a moderate potential to occur, additional analysis considered whether the species would be impacted by the project. Both direct effects (e.g., displacement of habitat) and indirect effects (e.g., noise) were considered. In addition, life history and habitat requirements were evaluated to ascertain the likelihood and severity of impact.

Special Status Animal Species

Of the special-status animals presented in Table IV.C-1, only the following species, which were observed or determined to have a moderate or high potential to occur within the project vicinity, are fully considered in the impact analysis (each species is discussed briefly below):

- Alameda whipsnake
- Cooper's hawk / red-tailed hawk / sharp-shinned hawk / great horned owl
- Fringed Myotis
- Long-Eared Myotis

Alameda Whipsnake. The Alameda whipsnake (*Masticophis lateralis euryxanthus*; listed as threatened under both federal and state regulations) is found in open-canopied shrub communities, including coastal scrub and chaparral, and adjacent habitats, such as grasslands (U.S. Fish and Wildlife Service, 2000). Habitats adjacent to shrub communities may be crucial to Alameda whipsnakes, which remain in grassland habitats near shrub areas for up to several weeks at a time (U.S. Fish and Wildlife Service, 2000). Other critical habitat elements for this species include rock outcrops and talus, which provide areas where prey (particularly fence lizards) may be found and where whipsnakes may find shelter, adequate prey populations, and small mammal burrows. Alameda whipsnakes are most often found on east to southeast and south facing slopes, where shrub cover is generally lower.

TABLE IV.C-1
SPECIAL-STATUS SPECIES CONSIDERED IN THE EVALUATION OF THE BUILDING 49 PROJECT

Common Name *Scientific Name*	Listing Status USFWS/ CDFG/CNPS	General Habitat	Potential for Species Occurrence Within the Project Area	Period of Identification
SPECIES LISTED OR PROPOSED FOR LISTING				
Invertebrates				
Bay checkerspot butterfly *Euphydryas editha bayensis*	FT/--/--	Serpentine bunchgrass grassland, larvae feed on *Plantago erecta*	**Low potential.** Grasslands in project area do not occur on serpentine or support larval host plants.	March–May
Callippe silverspot butterfly *Speyeria callippe callippe*	FE/--/--	Coastal areas in dunes, prairie, scrub, and grasslands supporting *Viola pedunculata*	**Low potential.** Grasslands on project site not suitable because they do not support species' host plant.	Spring
Fish				
Central California coastal steelhead *Oncorhynchus mykiss*	FT/CSC/--	Unblocked Bay Area and coastal rivers and streams	**Low potential.** Strawberry Creek contains downstream barriers to migration of this species. On-site drainages not large enough to support species.	Year-round
Winter-run chinook salmon *Oncorhynchus tshawytscha*	FE/CE/--	Unblocked Bay Area and coastal rivers and streams	**Low potential.** Strawberry Creek contains downstream barriers to migration of this species. On-site drainages not large enough to support the species.	Winter
Amphibians				
California tiger salamander *Ambystoma californiense*	PT/CSC/--	Wintering sites occur in grasslands occupied by burrowing mammals; breed in ponds and vernal pools	**Low potential.** Suitable aquatic habitat for this species is not present within the project area.	November–May
California red-legged frog *Rana aurora draytonii*	FT/CSC/--	Breed in stock ponds, pools, and slow-moving streams with emergent vegetation for escape cover and egg attachment	**Low potential.** On-site drainages do not provide suitable aquatic habitat for this species. No species occurrences are reported within several miles of the project site.	May–November
Reptiles				
Alameda whipsnake *Masticophis lateralis euryxanthus*	FT/CT/--	Inhabits open to partially open scrub communities, including coyote bush scrub and chamise chaparral on primarily south-facing slopes	**Low to Moderate potential.** Marginally suitable habitat for this species is present within the project area. Unlikely to be occupied territory but species may disperse through the site.	Spring

TABLE IV.C-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED IN THE EVALUATION OF THE BUILDING 49 PROJECT

Common Name *Scientific Name*	Listing Status USFWS/ CDFG/CNPS	General Habitat	Potential for Species Occurrence Within the Project Area	Period of Identification
SPECIES LISTED OR PROPOSED FOR LISTING (cont.)				
Birds				
American peregrine falcon Falco peregrinus	--/CE/--	Forages in marshes and grasslands; nesting habitat includes high, protected cliffs and ledges near water	**Low potential.** Suitable nesting habitat is not present within the project area. May forage in the vicinity of the project area.	Year-round
Bald eagle *Haliaeetus leucocephalus*	FT/CE/--	Nests and forages on inland lakes, reservoirs, and rivers; winter foraging at lakes and along major rivers	**Low potential.** May occur over site as migrant; no suitable foraging or nesting habitat in project vicinity.	Winter
Plants				
Large-flowered fiddleneck *Amsinckia grandiflora*	FE/CE/1B	Valley grassland, foothill woodland, annual grassland	**Low potential.** Project site contains marginally suitable habitat, however only 3 known natural occurrences, the nearest in E. Alameda County (CNPS 2003).	April - May
Pallid manzanita *Arctostaphylos pallida*	FT/CE/1B	Broadleaved upland forest, cismontane woodland, closed-cone coniferous forest, chaparral, and coastal scrub; found in siliceous shale, sand, or gravelly substrates	**Low potential.** The project site does not contain suitable soils for this species. Species readily recognizable and not seen during ESA's field surveys.	December–March
Robust spineflower *Chorizanthe robusta var. robusta*	FE/--/1B	Sandy or gravelly openings in cismontane woodland; also coastal dunes and coastal scrub	**Low potential.** Suitable habitat is not present on project site; i.e., tree and shrub cover too dense. Not seen in Alameda or adjacent counties since 1890s; presumed extirpated in Bay Area (CNPS 2003).	April–September
Presidio clarkia *Clarkia franciscana*	FE/CE/1B	Serpentine outcrops in coastal scrub and valley and foothill grassland	**Low potential.** Although habitat present, no serpentine outcrops observed in project area.	May–July
Santa Cruz tarplant *Holocarpha macradenia*	FT/CE/1B	Light, sandy, or sandy clay soil in coastal prairie and scrub and in valley and foothill grassland; often with non-native associates	**Low potential.** Marginally suitable habitat is present in the project area but naturally occurring populations have been extirpated from the Bay Area (CNPS 2003).	June–October
San Francisco popcorn flower *Plagiobothrys diffusus*	FSC/CE/1B	Coastal prairie and valley and foothill grassland	**Low potential.** The project site provides marginally suitable habitat but species known from fewer than 10 occurrences.	April–June

TABLE IV.C-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED IN THE EVALUATION OF THE BUILDING 49 PROJECT

Common Name *Scientific Name*	Listing Status USFWS/ CDFG/CNPS	General Habitat	Potential for Species Occurrence Within the Project Area	Period of Identification
FEDERAL OR STATE SPECIES OF CONCERN				
Invertebrates				
Monarch butterfly *Danaus plexippus*	--/*/--	Winters in eucalyptus groves. Winter roosting sites protected by State.	**Low potential.** Suitable habitat exists on-site but the species has not been documented as wintering within project area.	Winter
Bridges' coast range shoulderband snail *Helminthoglypta nickliniana bridgesi*	FSC/--/--	Inhabits open hillsides, prefers rock piles but can be found under tall grasses and weeds	**Low potential.** Marginally suitable habitat present in the project area but all sightings are historic.	Year-round
Ricksecker's water scavenger beetle *Hydrochara rickseckeri*	FSC/--/--	Specific habitat requirements are unknown; requires calm, shallow water of ponds and streams	**Low potential.** Suitable aquatic habitat is not present in the project area.	Unknown
Amphibians				
Foothill yellow-legged frog *Rana boylii*	FSC/CSC/--	Streams with permanent water and quiet pools absent of predatory fish	**Low potential.** Potential habitat is not present on the project site. No recorded occurrences within several miles of the project site.	April–June
Western spadefoot toad *Scaphiopus hammondii*	FSC/CSC/--	Grasslands or valley-foothill hardwood woodlands with shallow temporary ponds for breeding	**Low potential.** Project area streams do not provide suitable aquatic habitat for this species. Project site is not in species' range.	Winter
Reptiles				
Western pond turtle *Clemmys marmorata*	FSC/CSC/--	Freshwater ponds and slow streams edged with sandy soils for laying eggs	**Low potential.** Suitable habitat does not exist on the project site.	Year-round
California horned lizard *Phrynosoma coronatum frontale*	FSC/CSC/--	Patchy open areas with sandy soils	**Low potential.** Potential habitat is not present in the project area.	Year-round
Birds				
Cooper's hawk (nesting) *Accipiter cooperi*	--/CSC/--	Nests in riparian growths of deciduous trees and live oak woodlands	**Observed.** Nesting habitat is available nearby. Observed with kill at Bldg. 49 site (ESA 2003).	March–July
Sharp-shinned hawk (nesting) Accipiter striatus	--/CSC/--	Nests in riparian growths of deciduous trees and live oaks	**Low to Moderate potential.** Nesting habitat is present nearby.	March–July
Tricolored blackbird Agelaius tricolor	FSC/CSC/--	Riparian thickets and emergent vegetation	**Low potential.** Typical nesting habitat used by this species is not present large enough amount in project area.	Spring

TABLE IV.C-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED IN THE EVALUATION OF THE BUILDING 49 PROJECT

Common Name *Scientific Name*	Listing Status USFWS/CDFG/ CNPS	General Habitat	Potential for Species Occurrence Within the Project Area	Period of Identification
FEDERAL OR STATE SPECIES OF CONCERN (cont.)				
Birds (cont.)				
Grasshopper sparrow *Ammodramus savannarum*	FSC/--/--	Dry, dense grasslands, especially with a variety of grasses and tall forbs and scattered shrubs	**Low potential.** Suitable habitat is present on project site but species frequents more arid areas.	April–July
Bell's sage sparrow *Amphispiza belli belli*	FSC/CSC/--	Inhabits arid areas with low, fairly dense stands of shrubs, including chamise chaparral and coastal sage scrub	**Low potential.** Suitable scrub habitat is present on project site but species frequents more arid areas.	Year-round
Golden eagle *Aquila chrysaetos*	--/CSC/--	Nests in canyons and large trees in open habitats, prefer to forage in habitat with dense ground squirrel populations	**Low potential.** While suitable foraging habitat exists, nesting habitat is not present onsite.	Year-round
Burrowing owl *Athene cunicularia*	FSC/CSC/--	Nests in mammal burrows in open, lowland grasslands, also uses man-made structures	**Low potential.** Suitable nesting habitat is not present on project site.	February–June
Great horned owl *Bubo virginianus*	--/3503.5/--	Often uses abandoned nests of corvids or squirrels. Nests in large oaks, conifers, eucalyptus	**Moderate potential.** Suitable nesting habitat occurs on project site.	Year-round
Red-tailed hawk (nesting) *Buteo jamaicensis*	--/3503.5/--	Usually nests in large trees, often in woodland or riparian deciduous habitats	**Observed.** Suitable nesting habitat is present in the project area. Observed foraging at LBNL (ESA 2002a).	Year-round
Lark sparrow *Chondestes grammacus*	FSC/--/--	Inhabits sparse valley foothill hardwood, open mixed chaparral and brushy habitats, grasslands with scattered trees or shrubs	**Low potential.** Suitable nesting habitat is not present in project area, canopy cover too dense.	Year-round
White-tailed kite Elanus leucurus	FSC/--/--	Nests near wet meadows and open grasslands, in dense oak, willow, or other tree stands	**Low potential.** Open foraging habitat is not located in project area, reducing suitability of potential nesting habitat on and adjacent to project site.	March–July
Pacific-slope flycatcher Empidonax difficilis	FSC/--/--	Warm moist woodlands, including valley foothill and montane riparian, coastal and blue oak woodlands, and montane hardwood-conifer habitats	**Low potential.** Potential nesting habitat not present on project site.	Summer

TABLE IV.C-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED IN THE EVALUATION OF THE BUILDING 49 PROJECT

Common Name *Scientific Name*	Listing Status USFWS/CDFG/ CNPS	General Habitat	Potential for Species Occurrence Within the Project Area	Period of Identification
FEDERAL OR STATE SPECIES OF CONCERN (cont.)				
Birds (cont.)				
California horned lark Eremophila alpestris actia	--/CSC/--	Nests and forages in short-grass prairie, mountain meadow, coastal plain, fallow fields, and alkali flats	**Low potential.** Project site do not provide suitable habitat.	March–July
Merlin *Falco columbarius*	--/CSC/--	Breeds outside California, inhabits coastlines, open grasslands, savannahs, and woodlands	**Low potential.** May visit site in winter or during migration to breeding habitat outside California.	September–May
Yellow-breasted chat *Icteria virens*	--/CSC/--	Nests in riparian corridors with willows or other dense foliage	**Low potential.** Riparian vegetation present and may provide nesting habitat for this species but small patch size makes nesting unlikely.	March–September
Loggerhead shrike *Lanius ludovicianus*	FSC/CSC/--	Nests in shrublands and forages in open grasslands	**Low potential.** Suitable grassland habitat is not present in the project area.	March–September
Lewis' woodpecker *Melanerpes lewis*	FSC/--/--	Nests in cavities of dead or burned out trees in open, deciduous, and conifer habitats with brushy understory	**Low potential.** Rarely occurs on west side of East Bay Hills in oak woodland habitat in winter. Oak woodland habitat too dense to be suitable for nesting.	Winter
Rufous hummingbird *Selasphorus rufus*	FSC/--/--	Inhabits riparian areas, open woodlands, chaparral, and other habitat with nectar-producing flowers; breeding does not occur in San Francisco Bay Area	**Low potential.** May forage on the project site and in surrounding areas.	February–April
Allen's hummingbird *Selasphorus sasin*	FSC/--/--	Inhabits coastal scrub, valley foothill hardwood, and riparian habitats	**Low potential.** Project site contains no riparian habitat.	January–July
Bewick's wren *Thryomanes bewickii*	FSC/--/--	Inhabits chaparral, scrub, and landscaped areas, may also be found in riparian and edges of woodland habitats	**Low potential.** Preferred habitat not present on project site.	Year-round
California thrasher *Toxostoma redivivum*	FSC/--/--	Moderate to dense chaparral and scrub, open valley foothill riparian thickets	**Low potential.** Marginally suitable habitat is present in project area, but not on the project site.	Year-round

TABLE IV.C-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED IN THE EVALUATION OF THE BUILDING 49 PROJECT

Common Name *Scientific Name*	Listing Status USFWS/CDFG/ CNPS	General Habitat	Potential for Species Occurrence Within the Project Area	Period of Identification
FEDERAL OR STATE SPECIES OF CONCERN (cont.)				
Mammals				
Pacific western big-eared bat *Corynorhinus townsendii townsendii*	FSC/CSC/--	Inhabits a variety of habitats, requires caves or man-made structures for roosting	**Low potential.** Suitable roosting habitat not present on project site but may forage in the area.	April–August
Berkeley kangaroo rat *Dipodomys heermanni berkeleyensis*	FSC/--/--	Open grassy hilltops and open spaces in chaparral and blue oak/gray pine woodland	**Low potential.** Marginally suitable habitat is present in project area; however, this species is presumed extinct.	Year-round
Greater western mastiff bat *Eumops perotis californicus*	FSC/CSC/--	Breeds in rugged, rocky canyons and forages in a variety of habitats	**Low potential.** Suitable breeding habitat is not present in the project area but may forage in the area.	March–August
Long-eared myotis *Myotis evotis*	FSC/--/--	Inhabits woodlands and forests up to approximately 8,200 feet in elevation, roosts in crevices and snags	**Moderate potential.** Suitable roosting habitat is present in project area.	March–August
Fringed myotis Myotis thysanodes	FSC/--/--	Inhabits a variety of woodland habitats, roosts in crevices or caves, and forages over water and open habitats	**Moderate potential.** Suitable foraging and roosting habitat is present on project site.	March–August
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	FSC/CSC/--	Forests with moderate canopy and moderate to dense understory	**Low potential.** Although project site provides marginally suitable habitat for this species, it does not tend to occur in areas where human presence is high.	Year-round
Plants				
Bent-flowered fiddleneck *Amsinckia lunaris*	--/--/1B	Coastal bluff scrub, woodland, and valley and foothill grassland	**Low potential.** Marginally suitable habitat is present on project site but records from Oakland-Berkeley Hills are historic only.	March–June
Big-scale balsamroot *Balsamorhiza macrolepis* var. *macrolepis*	--/--/1B	Woodland and valley and foothill grassland, sometimes on serpentine soils	**Moderate potential.** Marginally suitable habitat is present on project site.	March–June
Mt. Diablo fairy-lantern *Calochortus pulchellus*	--/--/1B	Woody and shrubby slopes of chaparral, cismontane, and riparian woodland, and valley and foothill grassland	**Low potential.** Marginally suitable habitat is present on project site but species not known from Berkeley Hills.	April–June

TABLE IV.C-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED IN THE EVALUATION OF THE BUILDING 49 PROJECT

Common Name *Scientific Name*	Listing Status USFWS/CDFG/ CNPS	General Habitat	Potential for Species Occurrence Within the Project Area	Period of Identification
FEDERAL OR STATE SPECIES OF CONCERN (Continued)				
Plants (cont.)				
Western leatherwood Dirca occidentalis	--/--/1B	On brushy slopes and mesic areas of chaparral, riparian woodland and forest, and broadleaf or coniferous forest	**Low potential.** Suitable habitat is present on project site. However, species not observed during site surveys (ESA 2002; 2003).	January–April
Round-leaved filaree *Erodium macrophyllum*	--/--/2	On clay soils in woodland and valley and foothill grasslands	**Low potential.** Marginally suitable habitat is present on project site, however most collections historical (CNPS 2003).	March–May
Fragrant fritillary *Fritillaria liliacea*	FSC/--/1B	Cismontane woodland, coastal prairie and scrub, valley and foothill grasslands, often on serpentine soils	**Low potential.** Serpentine soils are not present on project site, unlikely to be found on other soils due to competition with non-native species.	February–April
Diablo helianthella *Helianthella castanea*	FSC/--/1B	Broadleaf upland forest, cismontane woodland, chaparral, coastal scrub, riparian woodland, and valley and foothill grassland.	**Moderate potential.** Marginally suitable habitat is present on project site.	April–June
Kellogg's horkelia *Horkelia cuneata* spp. *sericea*	FSC/--/1B	In sandy or gravelly openings of closed-cone coniferous forest, chaparral and coastal scrub	**Low potential.** Suitable habitat is not present on project site--coastal scrub dense with few openings. Presumed extirpated in Alameda Co. (USFWS 2003)	April–September
Large-flowered linanthus *Linanthus grandiflorus*	FSC/--/4	Cismontane woodlands, valley and foothill grassland, coastal scrub	**Moderate potential.** While habitat is marginal, the species is recently documented from Wildcat Peak (CalFlora 2003).	
Oregon meconella *Meconella oregana*	FSC/--/1B	Coastal scrub and prairie	**Moderate potential.** Known from five occurrences, including Oakland East, Richmond, and Briones Valley quads.	March - April
Robust monardella *Monardella villosa* ssp. *globosa*	--/--/1B	In clay or sandy soils of coastal prairie and scrub, and valley and foothill grassland	**Moderate potential.** Marginally suitable habitat is present on project site.	June–July
Most beautiful jewel-flower *Streptanthus albidus* ssp. *peramoenus*	FSC/--/1B	Ridges and slopes with chaparral, valley and foothill grassland, and woodland; on serpentine outcrops	**Low potential.** Although mixed grasslands occur on-site there were no serpentine soils or outcrops observed in project area.	April–June

TABLE IV.C-1 (Continued)
SPECIAL-STATUS SPECIES CONSIDERED IN THE EVALUATION OF THE BUILDING 49 PROJECT

STATUS CODES:

High potential = High to moderate quality habitat present and site within the geographic range, species is expected to occur

Moderate potential = Habitat only marginally suitable or habitat suitable but not within species geographic range

Low potential = Habitat does not meet species requirements as currently understood in the scientific community and/or site not within currently known species distribution or range

FEDERAL: (U.S. Fish and Wildlife Service)

- FE = Listed as endangered (in danger of extinction) by the federal government
- FT = Listed as threatened (likely to become endangered within the foreseeable future) by the federal government
- PE/PT = Proposed for listing as endangered or threatened or threatened
- FC = Candidate to become a *proposed* species
- FSC = Federal species of concern; may be endangered or threatened, but not enough biological information has been gathered to support listing at this time

STATE: (California Department of Fish and Game)

- CE = Listed as endangered by the State of California
- CT = Listed as threatened by the State of California
- CR = Listed as rare by the State of California (plants only)
- CSC = California Species of Special Concern
- * = Species designated as "Special Animals" by the state
- 3503.5 = Protection for nesting species of Falconiformes (hawks) and Strigiformes (owls)

California Native Plant Society

List 1A=Plants presumed extinct in California
List 1B=Plants rare, threatened, or endangered in California and elsewhere
List 2= Plants rare, threatened, or endangered in California but more common elsewhere
List 3= Plants about which more information is needed
List 4= Plants of limited distribution

SOURCES: CalFlora 2003; CNDDB, 2003; CNPS, 2003; USFWS, 2003; Zeiner et al., 1990.

Raptors: Cooper's Hawk / Red-Tailed Hawk / Sharp-Shinned Hawk / Great Horned Owl. The Cooper's hawk ranges over most of North America and may be seen throughout California, most commonly as a winter migrant. Nesting pairs have declined throughout the lower-elevation, more populated parts of the state. The Cooper's hawk forages in open woodlands and wooded margins and apparently nests in tall trees, often in riparian areas (Ehrlich et al., 1988; National Geographic, 1987; Harrison, 1979). Red-tailed hawks nest in a variety of trees in woodland and agricultural habitats. Coast live oak trees within the project vicinity as well as taller non-native trees such as eucalyptus and pine may be used by Cooper's hawk and red-tailed hawk for nesting. Both species have been observed in the project vicinity (ESA, 2003). The sharp-shinned hawk occurs throughout most of North America and is a resident species throughout California. Although this species was not observed during site surveys, coast live oak trees and non-native conifers within the project vicinity may support nesting sharp-shinned hawks (Ehrlich et al., 1988; National Geographic, 1987; Harrison, 1979). Great horned owls occur throughout North America and can be found in a variety of wooded habitats. These large raptors prey on small to

medium-sized mammals such as voles, rabbits, skunks, and squirrels. Great horned owls can often be seen and heard at dusk, perched in large trees. They roost in large trees, such as pines or eucalyptus and use these same trees to nest in. The often use the abandoned nests of crows, ravens, or sometimes squirrels (Erlich et al., 1988; Sibley, 2000).

Fringed Myotis. The fringed myotis occurs throughout California and is most frequent in coastal and montane forests and near mountain meadows (Jameson and Peeters, 1988). This species uses echolocation to find moths, beetles, and other prey and forms nursery colonies in caves and old buildings (Jameson and Peeters, 1988). Fringed myotis often use separate day and night roosts. Potential roosting habitat in the project area consists of peeling bark in eucalyptus or oak habitat.

Long-Eared Myotis. The long-eared myotis inhabits nearly all brushlands, woodlands, and forests, seeming to prefer coniferous forests and woodlands. Roosts include caves, buildings, snags, and crevices in tree bark. Caves provide night roosts. This species is highly maneuverable in its forays for arthropods over water, open terrain, and in habitat edges. Eucalyptus, as well as oak woodland habitat in the project area may provide potential roosting habitat for the long-eared myotis.

Special Status Plants

A thorough review and analysis of special status plant species, listed by the USFWS (2003), CNDDB (2003), and CNPS (2003) databases as occurring in the project vicinity (and listed in Table IV.C-1), indicates that the likelihood of adverse project impacts for most of the species listed is extremely low due to the following reasons:

- suitable habitat for a species either never existed on the project site or no longer does due to historical and ongoing disturbance of soils and vegetation;
- a species is not documented within the general vicinity of the project site (i.e., the western side of the Oakland-Berkeley Hills);
- only historical occurrences for a species are documented;
- a species has been extirpated from the quadrangle or county.

The following plant species were determined to have a moderate potential to occur on the project site. No focused floristic surveys have been carried out to date.

- Big-scale balsamroot,
- Diablo helianthella,
- Large-flowered linanthus,
- Oregon meconella, and
- Robust monardella

These are generally species of grasslands, coastal scrub, or woodlands. Because of ongoing vegetation management on the project site, there is only a small potential for these species to be present on roadcuts and other steep areas where native grasses are most prevalent. Generally, the potential for special status plant species to occur on the project site is low – none has been observed in past environmental studies for LBNL and none was observed during ESA's surveys.

The project site has been subject to ongoing disturbance, first in the form of grazing and then in the form of development, for the past 100 years or more. These types of disturbance, combined with the introduction of highly competitive non-native species, have resulted in the extirpation of a number of species that were documented as occurring in the Berkeley area in the late 1800s and early 1900s.

There are two special status plants listed in the databases as occurring in Strawberry Canyon, which lies approximately 0.5 miles to the southeast of the project site. The first of these, western leatherwood (*Dirca occidentalis*) has not been found within, or in the areas adjacent to, the project footprint. This shrub occurs almost exclusively on north-facing slopes, as an element of coastal scrub or oak woodland communities. The second, robust monardella (*Monardella villosa* ssp. *globosa*), is documented historically from the area. However, this species is generally found in chaparral, and no suitable habitat remains within or adjacent to the project footprint.

Although small areas of patchily distributed native grasses remain on the project site, the native herbaceous species in these areas noted by ESA (2002a; 2002b; 2003) are species commonly found throughout the Oakland-Berkeley Hills. Generally, less common species in these hills tend to be found on serpentine or other ultramafic soils or on thin soils, such as roadcuts, where non-native species do not compete as readily.

REGULATORY ENVIRONMENT

Federal Law, Regulations and Policies

The U.S. Fish and Wildlife Service (USFWS) is the federal agency responsible for managing biological resources that could occur on the project site. The mission of USFWS is to conserve, protect, and enhance the nation's fish and wildlife and their habitats for the continuing benefit of people. USFWS programs include management of wildlife sanctuaries, regulation of international and intrastate commerce related to wildlife, management of migratory species that move between states, wildlife management research, and identification and protection of endangered species.

Federal Endangered Species Act

Under the Federal Endangered Species Act (FESA), the Secretary of the Interior and the Secretary of Commerce have joint authority to list a species as threatened or endangered (16 United States Code [USC] 1533[c]). Pursuant to the requirements of FESA, a federal agency reviewing a proposed project within its jurisdiction must determine whether any federally listed or proposed species may be present in the project region, and whether the proposed project would result in a "take"[10] of such species. In addition, the agency is required to determine whether the

[10] "Take," as defined in Section 9 of the FESA, is broadly defined to include intentional or accidental "harassment" or "harm" to wildlife. "Harass" is further defined by the U.S. Fish and Wildlife Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, and sheltering. "Harm" is defined as an act which actually kills or injures wildlife. This may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

project is likely to jeopardize the continued existence of any species proposed to be listed under FESA, or result in the destruction or adverse modification of critical habitat for such species (16 USC 1536(a)(2),(4)). The "take" prohibition of FESA applies to any action that would adversely affect a single member of an endangered or threatened species.

Proposed species are granted limited protection under the act and must be addressed in Biological Assessments (under Section 7 of FESA); proposed species otherwise have no protection from "take" under federal law, except emergency-listed species.[11] Candidate species are afforded no protection under the act. However, the USFWS recommends that candidate species and species proposed for listing also be considered in informal consultation during a project's environmental review.

Migratory Bird Treaty Act and Bald Eagle Protection Act

The federal Migratory Bird Treaty Act (16 USC, Section 703, Supplement I, 1989) prohibits killing, possessing, or trading in migratory birds, except in accordance with regulations prescribed by the Secretary of the Interior. This act encompasses whole birds, parts of birds, and bird nests and eggs.

The federal Bald Eagle Protection Act prohibits persons within the United States (or other places subject to United States jurisdiction) from "possessing, selling, purchasing, offering to sell, transporting, exporting or importing any bald eagle or any golden eagle, alive or dead, or any part, nest or egg thereof."

State Law, Regulations and Policies

The primary state agency responsible for managing biological resources is the California Department of Fish and Game (CDFG). The mandate of CDFG is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. In particular, CDFG is required under the various state statutes to conserve species through listing, habitat acquisition and protection, review of local land use planning, multi-species conservation planning, stewardship, recovery, research, and education.

California Endangered Species Act

Under the California Endangered Species Act (CESA), CDFG has the responsibility for maintaining a list of threatened and endangered species (California Fish and Game Code Sec. 2070). CDFG also maintains a list of "candidate species," which are species formally noticed as being under review for addition to either the list of endangered species or the list of threatened species. In addition, CDFG maintains lists of "species of special concern," which serve as "watch lists." Pursuant to the requirements of CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any state-listed endangered or threatened species could be present on the project site and determine whether the proposed project could have a potentially

[11] Note, however, that protection from "take" begins at this stage under California state law.

significant impact on such species. In addition, CDFG encourages informal consultation on any proposed project that may impact a candidate species.

California Native Plant Protection Act

State listing of plant species began in 1977 with the passage of the California Native Plant Protection Act (NPPA), which directed CDFG to carry out the legislature's intent to "preserve, protect, and enhance endangered plants in this state." The NPPA gave the California Fish and Game Commission the power to designate native plants as endangered or rare and to require permits for collecting, transporting, or selling such plants. The California Endangered Species Act expanded upon the original NPPA and enhanced legal protection for plants. CESA established threatened and endangered species categories, and grandfathered all rare animals—but not rare plants—into the act as threatened species. Thus, there are three listing categories for plants in California: rare, threatened, and endangered.

California Fish and Game Code

The California Fish and Game Code provides a variety of protections to species that are not federally or state listed as threatened, endangered, or of special concern.

- Section 3503 protects all breeding native bird species in California, which prohibits the destruction of nests and eggs of any bird, with the exception of non-native English sparrows and European starlings (Section 3801).

- Section 3503.5 protects all birds of prey (in the orders Falconiformes and Strigiformes) by prohibiting the take, possession, or killing of raptors and owls, their nests, and their eggs.

- Section 3513 of the Code and the federal Migratory Bird Treaty Act (16 USC, Sec. 703, Supp. I, 1989) prohibit the killing, possession, or trading of migratory birds except in accordance with regulations prescribed by the Secretary of the Interior. This act applies to whole birds, parts of birds, and bird nests and eggs.

- Section 3800 of the Code prohibits the taking of nongame birds, which are defined as birds occurring naturally in California that are not game birds or fully protected species.

- Section 3511 [birds], Section 5050 [reptiles and amphibians], and Section 4700 [mammals]) designates certain wildlife species as fully protected in California.

Special-Status Natural Communities

Special-status natural communities are identified as such by CDFG's Natural Heritage Division and include those that are naturally rare and those whose extent has been greatly diminished through changes in land use. The California Natural Diversity Database (CNDDB) tracks 135 such natural communities in the same way that it tracks occurrences of special-status species: information is maintained on each site in terms of its location, extent, habitat quality, level of disturbance, and current protection measures. The CDFG is mandated to seek the long-term perpetuation of the areas in which these communities occur.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

Evaluation of potential project impacts on the biological resources of the site and surroundings requires analysis of the individual elements of the project and how introduction of those elements (separately or collectively) would affect the existing resources of the site.

To determine the level of significance of an identified impact, the criteria outlined in the state CEQA *Guidelines* ("*Guidelines*") were used. The following is a discussion of the approaches to, and definitions of, significance of impacts to biological resources, drawn from several distinct *Guideline*s sections.

The *Guidelines* (Section 15065) direct lead agencies to find that a project may have a significant effect on the environment if it has the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish and wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare or threatened species, or eliminate important examples of the major periods of California history or prehistory.

The *Guidelines* (Section 15206) further specify that a project shall be deemed to be of statewide, regional, or area-wide significance if it would substantially affect sensitive wildlife habitats including, but not limited to, riparian lands, wetlands, bays, estuaries, marshes, and habitats for rare and endangered species as defined by Fish and Game Code Section 903.

The *Guidelines* (Section 15380) further provide that a plant or animal species, even if not on one of the official lists, may be treated as "rare or endangered" if, for example, it is likely to become endangered in the foreseeable future.

Additional criteria to assess significant impacts to biological resources due to the proposed project are specified in the *Guidelines* Section 15382 (Significant Effect on the Environment) "…a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance."

In accordance with Appendix G of the *Guidelines* and the UC CEQA Handbook, a project would have a significant effect on the environment if it would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS;
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFG or USFWS;

- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;

- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;

- Fundamentally conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance;

- Fundamentally conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan; or

- Exceed an applicable LRDP or Program EIR standard of significance.

The following relevant impacts to biological resources have been anticipated and analyzed pursuant to CEQA, as part of the programmatic 1987 LRDP EIR, as amended, from which the present analysis is tiered:

Impact III-D-1:	Continued University operation of LBNL, including continued implementation of the 1987 LRDP, is not expected to reduce the number or restrict the range of any rare, endangered, or threatened plant or animal species, or to cause existing fish or wildlife populations to drop below self-sustaining levels.
Impact III-D-2:	Continued University operation of LBNL, including continued implementation of the LRDP, will result in the loss of some vegetation, including potential loss of mature trees and areas with some habitat for non-critical species.

As a result of anticipated impacts to biological resources, the following mitigation measures, adopted as part of the 1987 LRDP EIR, as amended, are already required for the proposed project, and are therefore incorporated as part of the proposed project's description:

Mitigation Measure III-D-2a:	Revegetation of disturbed areas, including slope stabilization sites, using native shrubs, trees, and grasses will be included as a part of all new projects.
Mitigation Measure III-D-2b:	Invasion of opportunistic colonizer trees and shrubs will be controlled. A maintenance program for controlling further establishment of eucalyptus, green wattle acacia, French broom, cotoneaster, and other opportunistic colonizer shrubs and trees in disturbed areas on-site will be undertaken. Herbicides will not be used for this purpose.
Mitigation Measure III-D-2c:	Removal of native trees and shrubs will be minimized. (To the greatest extent possible, the removal of large coast live

oak, California bay, and Monterey pine trees will be avoided.)

Mitigation Measure III-D-2d: Disturbance to the LBNL perimeter buffer zones will be minimized.

Mitigation Measure III-D-2e: LBNL activity and encroachment in Blackberry Canyon will be minimized.

IMPACTS AND MITIGATION MEASURES

Impact C.1: Construction of the project, including all earthmoving activities such as excavation and grading, would result in the permanent removal of approximately 1.1 acres of existing vegetation. (Less than Significant)

Excavation, grading, and construction activities would result in the overall removal of approximately 1.1 acres of existing vegetation at the Building 49 site, consisting of mixed grassland and eucalyptus grove. The proposed project would require removal of 22 eucalyptus trees and 1 California bay. Larger groves consisting of up to several hundred trees each in the general vicinity would remain untouched by the project: these include a large grove of Canary Island pines to the west, a grove of redwoods to the southwest, a riparian corridor of various trees to the west and southwest, and several contiguous groves of oak, bay, acacia, and eucalyptus trees stretching from south of the project to the northeast.

The proposed project includes the installation of replacement trees that would be planted or transplanted in various locations in and surrounding the project site. All trees placed by the proposed project would be irrigated as necessary. Because many of the removed trees would be replaced and numerous trees of the same types as those lost would still be available in the general vicinity for wildlife nesting, roosting, and foraging purposes, tree removal for this project would not be considered a significant impact.

Replacement vegetation would be drought-tolerant and deer proof, require low maintenance and fertilization, and be native to the East Bay Area environment. Mitigation Measures III-D-2a and III-D-2b, as set forth in the 1987 LRDP EIR, as amended, and reiterated above, stipulate that revegetation of disturbed areas will include the use of native plants species and that invasion of opportunistic colonizer trees and shrubs will be controlled. In addition, a maintenance program for controlling further establishment of eucalyptus, green wattle acacia, French broom, cotoneaster, and other opportunistic colonizer shrubs and trees in disturbed areas on-site will be undertaken. The proposed project incorporates the above-mentioned landscaping details into the design of the project, and, as such, would not have a substantial adverse effect on native vegetation in the project vicinity

Mitigation: None required

Impact C.2: Construction activities could adversely affect nesting raptors and other special-status nesting birds. (Significant)

The removal of several large eucalyptus trees within the project footprint, as well as noise generated by project construction activities, would have the potential to disturb nesting raptors or other special status nesting birds using the trees to be removed, or to result in the destruction or abandonment of special status bird nests, eggs, or fledglings. The 1987 LRDP EIR, as amended, considered nesting red-tailed hawks and great horned owls, the two raptor species most likely to be found on-site, and found no nests for either species during the field survey for the 1992 SEIR; therefore no further analysis of this potential impact was conducted and no mitigation measures were proposed at that time. However, local anecdotal reports and habitat suitability suggest that the above-mentioned raptors, as well as red-shouldered hawks, Cooper's hawks, sharp-shinned hawks, and a number of other bird species of concern (see Table IV.C-1) should be considered potentially present and possibly using the area for nesting purposes.

Were the potential impacts described above to occur as a result of the proposed project they would be considered significant under CEQA due to these species' protection under the federal Migratory Bird Treaty Act and the California Fish and Game Code, as well as their status as federal species of concern or California species of special concern. Therefore, the following mitigation measure will be implemented to reduce this potential impact to the level of less than significant.

Mitigation Measure C.2: Avoid disturbing active nests of raptors and other special-status bird species within 500 feet of the proposed project footprint.

For construction activities (i.e., ground clearing and grading, including removal of trees or shrubs) scheduled to occur during the nonbreeding season (August 1 through January 31), no mitigation is required. In addition, if construction activities commence during the nonbreeding season and continue into the breeding season, no mitigation is required. Birds that nest in the project area after construction activities are underway are assumed to be acclimated to construction activities.

If construction activities commence during the breeding season (February 1 through July 31), the following measures would avoid potential adverse effects on nesting special-status raptors and other nesting birds:

- A qualified wildlife biologist would conduct preconstruction surveys of all potential nesting habitat within 500 feet of construction activities.

- If active nests of raptors or other bird species are found during preconstruction surveys, a no-disturbance buffer zone would be created around active nests during the breeding season or until a qualified biologist determines that all young have fledged. The size of these buffer zones and types of construction activities restricted in these areas would be determined through coordination with CDFG and would be based on existing noise and human disturbance levels at the project site.

- If pre-construction surveys indicate that nests are inactive or potential habitat is unoccupied during the construction period, no further mitigation is required. Trees and shrubs that have been determined to be unoccupied by special-status birds or that are located more than 500 feet from active nests may be removed.

The above measures would mitigate the loss of individual active nests and avoid potentially significant impacts on nesting raptors.

No mitigation is necessary for general loss of bird habitat. In addition to numerous trees and shrubs suitable for nesting and not proposed for removal and located in close proximity to the proposed project site, there exists suitable, more extensive nesting and foraging habitat for non-raptor special-status bird species is located within protected, undeveloped lands less than one mile from the project site, at Tilden Park and Claremont Canyon Regional Preserve. The abundance and proximity of protected habitat similar in structure and composition suggests that population effects on these birds resulting from project activities would be minor. Therefore, based on the temporary nature of the tree removal, and the availability of suitable nesting habitat outside the construction disturbance zone and permanently protected habitat generally within the range of the species, the proposed project would not significantly affect habitat for nesting birds potentially occurring in the project area.

Significance after Mitigation: Less than Significant.

Impact C.3: Removal of trees and other proposed construction activities during the breeding season could result in direct mortality of special-status bats. In addition, construction noise and human disturbance could cause roost abandonment and death of young. (Significant)

The 1987 LRDP EIR, as amended, did not consider bats in its impacts analysis. However, the USFWS currently considers a number of bat species to be species of special concern, due to nationwide declines in many bat populations. Special-status bats may use crevices in exfoliating tree bark and/or hollow cavities in trees located on the project site and in surrounding areas.

Mitigation Measure C.3: Avoid disturbance of the roosts of special-status bats during the breeding season.

If construction activities (i.e., ground clearing and grading, including removal of trees or shrubs) are scheduled to occur during the nonbreeding season (September 1 through February 28), no mitigation is required.

If construction activities are scheduled to occur during the breeding season (March l through August 31), the following measures are required to avoid potential adverse effects on breeding special-status bats:

- A qualified bat biologist, acceptable to CDFG, would conduct preconstruction surveys of all potential breeding habitat within 200 vertical feet of construction activities. In late

winter or early spring, potentially suitable crevices would be located visually using a high-powered telescope. Bat emergence counts would be made at dusk as the bats depart from any suitable crevices. In addition, an acoustic detector would be used to determine any areas of activity. At least four nighttime emergence counts would be undertaken on nights that are warm enough for bats to be active, as determined by a qualified bat biologist.

- If active roosts are identified during preconstruction surveys, a no-disturbance buffer acceptable to CDFG would be created around active bat roosts during the breeding season. Bat roosts initiated during construction are presumed to be unaffected, and no buffer is necessary. However, the take of individuals would be prohibited.

- If preconstruction surveys indicate that roosts are inactive or potential habitat is unoccupied during the construction period, no further mitigation is required. Trees and shrubs that have been determined to be unoccupied by special-status bats or that are located outside the no-disturbance buffer for active roosts may be removed.

Significance after Mitigation: Less than Significant.

Impact C.4: The proposed project has a low potential for take or harassment of Alameda whipsnakes potentially dispersing through the project vicinity. (Significant)

The project site lies approximately 0.5 mile to the west from formerly designated critical habitat for the Alameda whipsnake.[12] After it conducted site visits during the summer of 2000, the U.S. Fish and Wildlife Service (USFWS) determined that certain LBNL areas, including those with existing facilities, should be excluded from its final critical habitat listing (USFWS, 2000). Since the proposed Building 49 site can be considered infill between existing facilities and contains none of the critical habitat elements for the whipsnake, it was not considered to be critical habitat for the Alameda whipsnake.

The shrub community closest to the proposed project site is an area of north coastal scrub approximately 600 feet to the south, which was one of three areas on the LBNL site identified as a potential habitat site for the species (McGinnis, 1996). While there are no dispersal barriers between this area of coastal scrub and the project site, McGinnis determined this area to be sub-optimal habitat for the whipsnake, and it is separated from the project site by eucalyptus and mixed hardwood habitat. A continuous corridor of open space along the northern slope of Strawberry Canyon connects this stand of coastal scrub to another such stand located further to the east, which was identified as suitable habitat with the potential to support whipsnakes (McGinnis, 1996). While there are a few smaller buildings and several roads crossing this area, this open space provides a potential dispersal corridor from areas designated as critical habitat for the species (USFWS, 2000) to the project site.

[12] Critical habitat for the Alameda whipsnake was rescinded by court order on May 9, 2003. For the purposes of this analysis, the concept is still relevant in that the designation of critical habitat implies a high likelihood of species' presence where critical habitat elements are found. Even though critical habitat has been rescinded, the species is still fully protected under the Endangered Species Act. Therefore, the court's action does not change the analysis presented in the EIR, since the project sites were not considered to be critical habitat.

Alameda whipsnakes can be found in grassland, woodland, and riparian habitat located at some distance from shrub communities. However, the habitat value of the grasslands in the project area is attenuated by the small size of these areas, their distance from areas of coastal scrub, and the lack of rock outcrops both on the project site and in the surrounding area. On-site grassland habitat value is further reduced by annual vegetation management for fuel reduction purposes, which includes reduction of grass and shrub heights, either with goats or by mechanical means. The presence of a wide mix of habitat types, including heavily wooded areas with little ground cover and reduction of vegetative cover for fuel management purposes in other parts of the potential dispersal corridor mentioned above reduces the possibility that whipsnakes would use the area to move through in search of suitable habitat.

Nevertheless, due to the residual potential for Alameda whipsnake movement into the project area from less developed and disturbed areas nearby, mitigation measures will be implemented to ensure that whipsnakes are protected to the greatest extent possible during project construction. Without proper mitigation, impacts to the snake would be a potentially significant impact. The mitigation measures presented below are based on avoidance measures developed in informal consultation with USFWS during site surveys for the water tank and fire road realignment components of the LBNL Sitewide Water Distribution Upgrade project (which, unlike the proposed project, was located in formerly designated critical habitat for the Alameda whipsnake). The incorporation of these mitigation measures into the project resulted in an informal determination by USFWS that the Sitewide Water Distribution Upgrade project would not be likely to adversely affect the Alameda whipsnake or its critical habitat (USFWS 2000; LBNL NEPA/CEQA Program 2001; J. Phillibar, pers. com. 2002)

Mitigation Measure C.4a: Daily site surveys for Alameda whipsnake shall be carried out by a designated monitor.

Each morning, prior to the initiation of excavation, construction, or vehicle operation, the project area shall be surveyed by a designated monitor, trained in Alameda whipsnake identification and ecology by a qualified biologist, to ensure that no Alameda whipsnakes are present. This survey shall not be intended to be a protocol-level survey, but rather one designed to verify that no snakes are actually on-site each day. All lay-down and deposition areas, as well as any other areas that might conceal or shelter snakes or other animals would be inspected each morning by the designated monitor to ensure that Alameda whipsnakes are not present.

Mitigation Measure C.4b: Worker environmental sensitivity training shall be conducted by the designated monitor prior to each worker's commencing activities on-site.

All on-site workers would attend an Alameda whipsnake information session conducted by the designated monitor prior to beginning work on-site. This session would cover identification of the species and procedures to be followed if an individual is found on site, as well as basic site rules meant to protect biological resources, such as speed limits, no littering, and no smoking.

Mitigation Measure C.4c: Hours of operation and speed limits shall be instituted and posted.

All construction activities that take place on the ground would be performed in daylight hours when snakes can be seen. Vehicle speed on site shall not exceed 5 miles per hour.

Mitigation Measure C.4d: Site vegetation management shall take place prior to tree removal, grading, excavation, or other construction activities. Construction materials, soil, construction debris, or other material shall be deposited only on areas where vegetation has been mowed such that the absence of any snakes can be visually confirmed.

The Building 49 site is subject to annual vegetation management involving the close-cropping of all grasses and ground cover on the project area; this management shall be undertaken prior to initiation of construction. Re-mowing shall be done if grass or other vegetation on the Building 49 site becomes high enough to conceal whipsnakes during the construction period.

Significance after Mitigation: Less than Significant.

Impact C.5: The proposed project could harm or temporarily disturb common wildlife species. (Less than Significant)

Proposed project activities could disturb common wildlife species that exist within the proposed project area, including black-tailed deer, raccoon, striped skunk, and gopher snakes. Animals within these habitats, such as small mammals and reptiles, could be temporarily displaced during habitat removal, and subjected to noise and other human disturbances, as well as to direct mortality. The amount of habitat for these animals permanently lost as a result of the project is insignificant when compared to the amount of similar habitat present in the general vicinity. Habitat temporarily removed during project construction would be revegetated similar to pre-project conditions. The proposed project would therefore result in a less-than-significant impact on common wildlife species.

Mitigation: None required

Impact C.6: Construction activities have low potential to disturb or result in mortality of special status plant species or eliminate their habitat. (Less than Significant)

As noted in the Setting, the potential for special status plant species to occur on the project site is low as a result of ongoing disturbance of the site and the introduction of highly competitive non-native species.

Mitigation: None required

CUMULATIVE IMPACTS

Impact C.7: The project, when combined with other proposed on-site LBNL development, as well as surrounding residential development in the Oakland-Berkeley Hills, would contribute to a reduction of natural resources, including habitat for native plants and wildlife. (Less than Significant)

Other LBNL development, such as the recently approved Molecular Foundry project, as well as residential development taking place throughout the Oakland-Berkeley Hills, would combine to reduce available habitat for both common and special status wildlife and plants. Taken together, these projects comprise a cumulative impact to biological resources. However, the overall contribution of the proposed project to this impact is relatively small. The Building 49 project would affect approximately 1.1 acres of what is currently undeveloped land, mostly mixed grasslands and eucalyptus. Vegetation would be replanted in accordance with LBNL's Integrated Landscape Management Program. Because, with mitigation, permanent habitat loss due to the project would be almost nil, it would not be considered a cumulatively considerable contribution of the project to the region-wide cumulative impact. In addition, mitigation measures proposed for the project will reduce the impacts of this specific project to less than significant. None of the other projects identified in this EIR at LBNL, the City of Berkeley, or on the UC Berkeley campus would considerably add to a biological resources impacts in concert with the proposed project.

Mitigation: None required.

SUMMARY OF IMPACTS AND MITIGATION MEASURES

As noted in the discussion above, under the 1987 LRDP EIR, as amended, with the incorporation of the proposed Mitigation Measures, the proposed project would not exceed the Standards of Significance established for environmental effects related to Biological Resources.

The proposed project would incorporate 1987 LRDP EIR, as amended, Mitigation Measures III-D-2a through III-D-2e.

Potentially significant impacts not mitigated by the 1987 LRDP EIR, as amended: Building 49 project specific Mitigation Measures C.2 through C.4d have been added to fully mitigate potential impacts to biological resources within the project footprint. As a result, no significant biological resources impacts would result from the proposed project.

Building 49 Project-Specific Mitigation Measures: See Mitigation Measures C.2 through C.4d presented above.

D. CULTURAL RESOURCES

INTRODUCTION

As more fully described in the 1987 LRDP EIR, as amended, potential impacts on cultural resources (historical or archaeological) could result from continued University operation of LBNL, including facility development contemplated in the 1987 LRDP.

This section presents a summary of the history of the proposed project site and vicinity. The information in this section is based on technical studies prepared for the project area. These technical studies include archival research at the Northwest Information Center (NWIC), completed on June 27, 2003, a cultural resources evaluation and survey completed by Archaeological Research Services in 1986, and an archaeological survey report prepared by Butler International Corporation, dated September 1999.

SETTING

REGIONAL SETTING

The beginning date for the prehistoric Native American occupation of Northern California is generally agreed to be about 2,000 B.C., at least in the San Francisco Bay region. Linguistic evidence suggests that the Native Americans that lived in the area spoke Chochenyo, one of the Costanoan[13] languages. In 1770, the Costanoan-speaking people lived in approximately 50 separate and politically autonomous nations or tribelets. Early Spanish diaries record a number of small villages along the foothills of the East Bay area (King, 1978:66). Ethnographic sources indicate that one settlement, named Huchiu-n, may have been situated in the general vicinity of the present site of Berkeley (Kroeber, 1925). During the mission period, 1770-1835, the Costanoan people experienced cataclysmic changes in almost all areas of their life, particularly a massive decline in population due to introduced diseases and declining birth rate. Following the secularization of the missions by the Mexican government in the 1830s, most Native Americans gradually left the missions to work as manual laborers on the ranchos that were established in the surrounding areas. Native American archaeological sites in this portion of Alameda County tend to be situated along ridgetops, midslope terraces, alluvial flats, near ecotones[14], and near sources of water including springs.

[13] "Costanoan" is derived from the Spanish word Costanos meaning "coast people." No native name of the Costanoan people as a whole existed in prehistoric times as the Costanoan were neither a single ethnic group nor a political entity.

[14] An "ecotone" is defined as the zones transition between adjacent ecological systems, having a set of characteristics uniquely defined by space and time scales and by the strength of interactions between them.

LOCAL SETTING

As part of the environmental analysis for the 1987 LRDP EIR, as amended, all undeveloped land and proposed building locations (including the proposed Building 49 site) were examined for potential historical and archaeological resources. All reasonably accessible parts of the LBNL area were examined. Special attention was given to areas of relatively flat land or rock outcrops. The steep hillsides were not examined intensively, although transects through accessible areas were made. Based on the findings of the historic and archaeological resources survey, no indications of historic or prehistoric archaeological resources were encountered in any location within the project site.

More recently, an archaeological survey of four parcels (70 acres total), and a recordation and evaluation of four historic structures was conducted for LBNL in September 1999. Based on the results of the survey, with concurrence from the State Historic Preservation Officer (SHPO), no indications of significant historic or prehistoric archaeological resources were encountered. No historic structures exist on the project site as it is currently vacant.

REGULATORY ENVIRONMENT

NATIONAL REGISTER OF HISTORIC PLACES

Properties are nominated to the National Register of Historic Places by the State Historic Preservation Officer of the state in which the property is located, by the Federal Preservation Officer for federally-owned or controlled property, or by the Tribal Preservation Officer for tribally owned property. Generally, properties must be at least 50 years old, or "exceptionally important" to be considered eligible for listing. The National Register requires that listed properties meet the following criteria:

According to the National Park Service (2001), the quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting materials, workmanship, feeling, and association, and that:

(A) Are associated with events that have made a significant contribution to the broad patterns of our history;

(B) Are associated with the lives of persons significant in our past;

(C) Embody the distinctive characteristics of a type, period, or method of construction, that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(D) Have yielded, or may be likely to yield, information important in prehistory or history.

STATE OFFICE OF HISTORIC PRESERVATION

The California Register of Historical Resources identifies the state's historical resources as well as architectural, historical, archaeological, and cultural resources. The California Register includes properties listed in or formally determined eligible for the National Register and lists selected California Registered Historical Landmarks. The Office of Historic Preservation also maintains the *Directory of Properties in the Historic Property Data File*. Properties on the Property Data File are not protected or regulated.

The State Office of Historic Preservation sponsors the California Historical Resources Information System (CHRIS), a statewide system for managing information on the full range of historical resources identified in California. CHRIS is a cooperative partnership between the citizens of California, historic preservation professionals, 11 information centers, and various agencies (Office of Historic Preservation, 2001). CHRIS provides an integrated database that furnishes site-specific archaeological and historical resources information on known resources and surveys to government, institutions, and individuals. CHRIS also supplies a list of qualified consultants.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The impact of LBNL projects on cultural resources would be considered significant if they would exceed the following Standards of Significance, in accordance with Appendix G of the state CEQA *Guidelines* and the UC CEQA Handbook:

- Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5;
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5;
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature;
- Disturb any human remains, including those interred outside of formal cemeteries; and,
- Exceed an applicable LRDP or Program EIR standard of significance.

Section 15064.5 of the state CEQA *Guidelines* defines a historical resource as:

(1) A resource listed in, or determined to be eligible by the State Historical Resources Commission for listing in, the California Register of Historical Resources.

(2) A resource included in a local register of historical resources, as defined in Section 5020.1(k) of the Public Resources Code or identified as significant in a historical resource survey meeting the requirements of Section 5024.1(g) of the Public Resources Code, shall be presumed to be historically or culturally significant. Public agencies must

treat any such resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.

(3) Any object, building, structure, site, area, place, record, or manuscript which a Lead Agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be a historical resource, provided the Lead Agency's determination is supported by substantial evidence in light of the whole record.

A "substantial adverse change" is defined in CEQA *Guidelines* Section 15064.5(b)(1) as "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired."

The following relevant impacts to cultural resources have been anticipated and analyzed pursuant to CEQA, as part of the programmatic 1987 LRDP EIR, as amended, from which this analysis is tiered:

Impact III-E-1:	Continued University operation of LBNL, including continued implementation of the 1987 LRDP, while resulting in removal of substandard buildings, is not expected to adversely impact any significant prehistoric, archaeological or paleontological site, or any property of historic or cultural significance, other than the Laboratory itself.
Cumulative Impacts:	No significant cumulative impacts to archaeological or historical resources at and in the vicinity of LBNL are anticipated.

The 1987 LRDP EIR, as amended, does not contain cultural resources mitigation measures that would be applicable to the proposed project. All potential impacts were found to be less than significant.

EXCAVATION, GRADING, AND CONSTRUCTION IMPACTS

Impact D.1: Construction of the proposed project could result in discovery of and/or inadvertent damage to important prehistoric (Native American) or historic archaeological resources. (Significant)

Archival research at the California Historical Resources Information System's Northwest Information Center (Northwest Information Center) was undertaken to determine whether any archaeological resources have been discovered in the project vicinity. The Northwest Information Center states that it has no record of Native American or historic cultural resources at the project site or in the vicinity (June 27, 2003). Native American archaeological sites in this portion of Alameda County tend to be situated on terraces along ridgetops, midslope terraces, alluvial flats, near ecotones, and near sources of water including springs. The project vicinity is situated on a steep slope adjacent to Strawberry Creek. Therefore, there is a low-to-moderate

potential for Native American sites on the project site. Although, the Northwest Information Center has no record of an archaeological study of the project vicinity, it states that no historic properties within the project vicinity are listed on State and federal inventories. Review of historical literature and maps on file in the Northwest Information Center office gave no indication of historic archaeological sites or historic structures in the project area. Therefore, there is a low possibility of identifying historic cultural resources on the project site.

However, in the unlikely event of the discovery of archaeological and paleontological artifacts during construction, including grading, excavation, and other earthmoving activities, the following project-specific mitigation measure is identified.

Mitigation Measure D.1a: If an archaeological and/or paleontological artifact were discovered onsite during construction, all activities within a 50-foot radius would be halted and a qualified archaeological/paleontological monitor would be summoned within 24 hours to inspect the site. If the find were determined to be significant and to merit formal recording or data collection, time and funding would be devoted to salvage the material. Any archaeologically important data recovered during monitoring would be cleaned, catalogued and analyzed, with the results presented in a report of finding that satisfies professional standards.

Implementation of the above project-specific mitigation measure would further reduce the less-than-significant impact.

Since the proposed project is unlikely to contain any archaeological and paleontological resources, it would also be unlikely to encounter human remains in the vicinity of the project site. However, if human remains should be encountered during construction, work would be halted and the following project-specific mitigation measure implemented.

Mitigation Measure D.1b: In the event that human skeletal remains were uncovered during construction or ground-breaking activities on the project site, all work would immediately halt and the Alameda County Coroner would be contacted to evaluate the remains.

Significance after Mitigation: Less than Significant.

Impact D.2: The project would not affect historic architectural resources located within the vicinity of the project site. (Less than Significant)

The proposed project site is located on a currently undeveloped hillside east of Cyclotron Road. As no built structure is located on the project site, and no buildings within the project vicinity have been deemed historic, no impacts to historic architectural resources would occur.

Mitigation: None required.

CUMULATIVE IMPACTS

Impact D.3: The project, when combined with other proposed on-site LBNL and nearby development, such as the recently approved Molecular Foundry, could affect archaeological resources. (Less than Significant)

Implementation of the proposed project, including ground disturbance and excavation, would result in a very small chance that archaeological resources might be disturbed. Other development on as yet undeveloped sites in the area, including the approved Molecular Foundry building, would have a similar project-specific result. However, in these cases, such impacts are not reasonably foreseeable and both include mitigation measures that would render any unexpected impacts to less than significance. According to the LBNL LRDP and 1987 LRDP EIR, as amended, overall development at LBNL would not adversely impact the cultural resources. None of the other projects identified in this EIR at LBNL, the City of Berkeley, or on the UC Berkeley campus would add to a substantial cultural resources cumulative impact in concert with the proposed project.

SUMMARY OF IMPACTS AND MITIGATION MEASURES

As noted in the discussion above, under the 1987 LRDP EIR, as amended, with the incorporation of the proposed Mitigation Measures, the proposed project would not exceed the Standards of Significance established for cultural resource impacts.

Potentially significant impacts not mitigated by 1987 LRDP EIR, as amended, mitigation measures: Building 49 project-specific Mitigation Measure D.1a and D.1b have been added to fully mitigate potential impacts to subsurface archaeological resources resulting from project construction. As a result, no significant cultural resources impacts would result from the proposed project.

Building 49 Project-Specific Mitigation Measures: See Measures D.1a and D.1b presented above.

E. GEOLOGY AND SOILS

INTRODUCTION

As more fully described in the 1987 LRDP EIR, as amended, potential geology and soils impacts could result from continued University operation of LBNL, including continued facility development as contemplated in the 1987 LRDP.

This section discusses the site's regional geologic and seismic setting, and analyzes potential geologic and seismic hazards that may affect the proposed project based upon the site conditions and location, focusing on increased exposure of people and structures to issues such as surface fault rupture, groundshaking, landsliding, and erosion.

SETTING

GEOLOGIC SETTING

LBNL lies within the geologic region of California referred to as the Coast Ranges geomorphic province.[15] Discontinuous northwest-trending mountain ranges, ridges, and intervening valleys composed of ancient seafloor rocks characterize this province. The Franciscan Assemblage is the principal rock complex within the Coast Ranges and is composed of marine sedimentary and volcanic rocks. The Franciscan Assemblage in this region of California is Jurassic- to Cretaceous-age (approximately 65 to 150 million years old) and consists primarily of greenstone (altered volcanic rocks), basalt, chert (ancient silica-rich ocean deposits), and sandstone that originated as ancient seafloor sediments.

Contained within the Coast Ranges province is the Diablo Range, which extends from the Carquinez Strait south 170 miles to Coalinga. The Diablo Range includes Mount Diablo, the Oakland–Berkeley Hills, Mount Hamilton, and the mountains that form the eastern boundary of the Santa Clara Valley. Bedrock in this range includes the Franciscan Assemblage and other ancient marine sedimentary rocks.

The project site is located on the western slope of the Oakland-Berkeley Hills. Building 49 is underlain by shallow bedrock consisting of Upper-Cretaceous age fine- to coarse-grained sandstone and shale. Bedrock outcrops in Cyclotron Road road-cut exposures consist mostly of sandstone, with some interbedded mudstone (Fugro, 2002a,b,c).

MINERAL RESOURCES

The California Department of Conservation, Geological Survey (CGS, formerly Division of Mines and Geology) has classified lands within the San Francisco-Monterey Bay Region into Aggregate and Mineral Resource Zones (MRZs) based on guidelines adopted by the California

[15] A geologic province is an area that that possesses similar bedrock, structure, history, and age. California has 11 geologic provinces.

State Mining and Geology Board, as mandated by the Surface Mining and Reclamation Act (SMARA) of 1974 (Stinson et al., 1983). The RBD is mapped by the CGS as MRZ-1, an area where no significant mineral or aggregate deposits are present (Sti*nson et al., 1983).

SOILS

The U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) (formerly known as the Soil Conservation Service) has characterized the majority of on-site soils as Maymen loam, 30 to 75 percent slopes. Maymen loam is a shallow, moderately permeable soil that exhibits rapid to very rapid runoff, and has a high to very high erosion hazard (USDA, 1981). Geotechnical investigations at the Building 49 site encountered 4 to 5 feet of fill materials underlain by 5 to 9 feet of colluvial soils. Fill and colluvial soils consisted of stiff sandy to gravely clay (Fugro 2002a).

GROUNDWATER

Depth to groundwater beneath the project site is estimated to vary significantly, and locally "perched" groundwater or seeps may be present. Groundwater was not encountered during geotechnical and fault investigations borings and trenching at the Building 49 site, but it was noted that previous investigations for Building 50B, located directly upslope, encountered groundwater at 686 feet above mean sea level (amsl). Previously encountered groundwater at adjoining upslope sites may represent perched groundwater or seepage zones, and localized groundwater may therefore also be present at the project site (Fugro, 2002a,c). Geotechnical and fault investigations at the Building 49 site took place during the summer months, when groundwater depths are typically lowest.

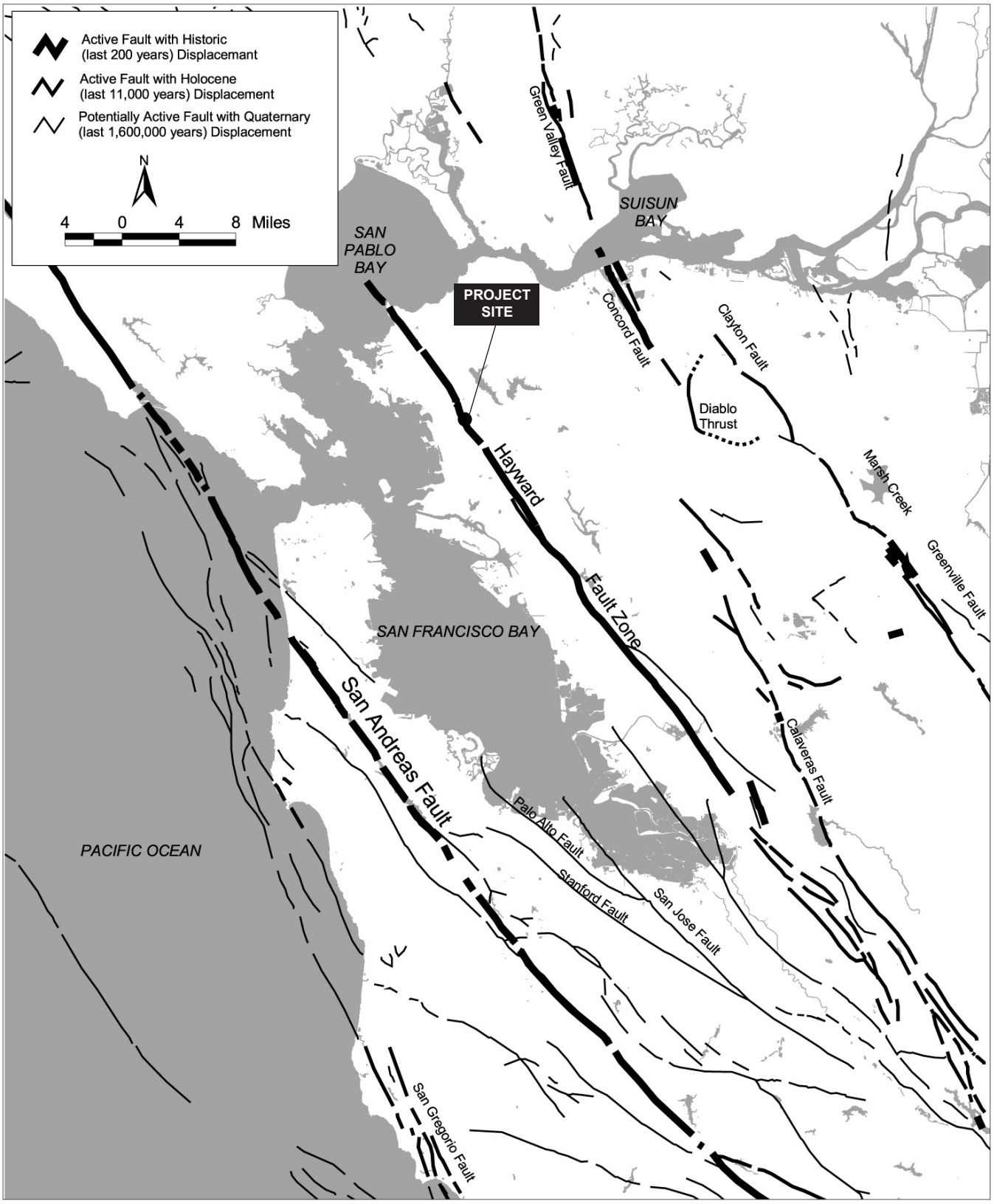
TOPOGRAPHIC SETTING

The Building 49 site is located on an undeveloped steep slope with an average inclination of 2:1 (horizontal to vertical), north of Cyclotron Road, and immediately northwest of LBNL's Blackberry Canyon entrance. Existing elevations at the site vary between approximately 710 and 630 feet amsl (Fugro, 2002c).

SEISMICITY

The San Francisco Bay Area contains both active and potentially active faults and is considered a region of high seismic activity (see Figure IV.E-1).[16] The 1997 Uniform Building Code locates the entire Bay Area within Seismic Risk Zone 4. Areas within Zone 4 are expected to experience

[16] An "active" fault is defined by the State of California as a fault that has had surface displacement within Holocene time (approximately the last 10,000 years). A "potentially active" fault is defined as a fault that has shown evidence of surface displacement during the Quaternary (last 1.6 million years), unless direct geologic evidence demonstrates inactivity for all of the Holocene or longer. This definition does not, of course, mean that faults lacking evidence of surface displacement are necessarily inactive. "Sufficiently active" is also used to describe a fault if there is some evidence that Holocene displacement occurred on one or more of its segments or branches (Hart, 1997).



SOURCE: California Department of Conservation, Geological Survey (After Jennings, 1994)

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Figure IV.E-1
Fault Map

maximum magnitudes and damage in the event of an earthquake (Lindeburg, 1998). The U.S. Geological Survey (USGS) Working Group on California Earthquake Probabilities has evaluated the probability of one or more earthquakes of Richter magnitude 6.7 or higher occurring in the San Francisco Bay Area within the next 30 years. The result of the evaluation indicated a 62 percent likelihood that such an earthquake event will occur in the Bay Area between 2000 and 2030 (USGS, 2003).

While the magnitude is a measure of the energy released in an earthquake, intensity is a measure of the ground shaking effects at a particular location. The estimated (moment) magnitudes shown in Table IV.E-1 represent characteristic earthquakes on particular faults.[17] Ground movement during an earthquake can vary depending on the overall magnitude, distance to the fault, focus of earthquake energy, and type of geologic material. The composition of underlying soils, even those relatively distant from faults, can intensify ground shaking. The Modified Mercalli (MM) intensity scale (see Table IV.E-2) is commonly used to measure earthquake effects due to ground shaking. The MM values for intensity range from I (earthquake not felt) to XII (damage nearly total), and intensities ranging from IV to X could cause moderate to significant structural damage.[18] At LBNL, maximum ground shaking intensity resulting from an earthquake generated on an active Bay Area fault, discussed below, is anticipated to be very violent (MM X) (ABAG, 2003a).

REGIONAL FAULTS

The project site is immediately adjacent to the Hayward Fault Zone and approximately 19 miles northeast of the active San Andreas Fault Zone (see Figure IV.E-1). The San Andreas and Hayward fault exhibit strike-slip orientation and have experienced movement within the last 150 years.[19] Other principal faults capable of producing significant ground shaking at the project site are listed on Table IV.E-1 and include the San Gregorio-Hosgri, Calaveras, Concord–Green Valley, Marsh Creek–Greenville, and Rodgers Creek faults.

Hayward Fault Zone

The Hayward Fault Zone is the southern extension of a fracture zone that includes the Rodgers Creek fault (north of San Pablo Bay), the Healdsburg fault (Sonoma County), and the Maacama fault (Mendocino County). The Hayward fault trends to the northwest within the East Bay, extending from San Pablo Bay in Richmond, 60 miles south to San Jose, when it converges with

[17] Moment magnitude is related to the physical size of a fault rupture and movement across a fault. The Richter magnitude scale reflects the maximum amplitude of a particular type of seismic wave. Moment magnitude provides a physically meaningful measure of the size of a faulting event (CGS, 1997b). The concept of "characteristic" earthquake means that we can anticipate, with reasonable certainty, the actual earthquake that can occur on a fault.

[18] The damage level represents the estimated overall level of damage that will occur for various MM intensity levels. The damage, however, will not be uniform. Some buildings will experience substantially more damage than this overall level, and others will experience substantially less damage. Not all buildings perform identically in an earthquake. The age, material, type, method of construction, size, and shape of a building all affect its performance (ABAG, 1998).

[19] A strike-slip fault is a fault on which movement is parallel to the fault's strike (Bates and Jackson, 1984).

TABLE IV.E-1
ACTIVE FAULTS IN THE VICINITY OF BUILDING 49

Fault	Distance and Direction from project site	Recency of Movement	Fault Classification	Historical Seismicity[a]	Maximum Moment Magnitude Earthquake (Mw)[b]
Hayward	300 to 400 feet west	Historic (1836; 1868 ruptures) Holocene	Active	M6.8, 1868 Many <M4.5	7.1
Concord–Green Valley	14 miles northeast	Historic (1955) Holocene	Active	Historic active creep	6.9
San Andreas	19 miles southwest	Historic (1906; 1989 ruptures) Holocene	Active	M7.1, 1989 M7.9, 1906 M7.0, 1838 Many <M6	7.9
Calaveras	18 miles southeast	Historic (1861 rupture) Holocene	Active	M5.6–M6.4, 1861 M4–M4.5 swarms 1970, 1990	6.8
Rodgers Creek	23 miles north	Historic Holocene	Active	M6.7, 1898 M5.6, 5.7, 1969	7.0
Marsh Creek–Greenville	25 miles east	Historic (1980 rupture) Holocene	Active	M5.6 1980	6.9
San Gregorio-Hosgri	26 miles southwest	Holocene – Late Quaternary	Active	Many M3-6.4	7.3

[a] Richter magnitude (M) and year for recent and/or large events. The Richter magnitude scale reflects the maximum amplitude of a particular type of seismic wave.

[b] Moment magnitude is related to the physical size of a fault rupture and movement across a fault. Moment magnitude provides a physically meaningful measure of the size of a faulting event (CGS, 1997b). The Maximum Moment Magnitude Earthquake (Mw), derived from the joint CGS/USGS Probabilistic Seismic Hazard Assessment for the State of California, 1996. (CGS OFR 96-08 and USGS OFR 96-706).

SOURCES: Hart, 1997; Jennings, 1994; Peterson, 1996.

TABLE IV.E-2
MODIFIED MERCALLI INTENSITY SCALE

Intensity Value	Intensity Description	Average Peak Acceleration
I	Not felt except by a very few persons under especially favorable circumstances.	< 0.0017 g[a]
II	Felt only by a few persons at rest, especially on upper floors on buildings. Delicately suspended objects may swing.	< 0.014 g
III	Felt noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly, vibration similar to a passing truck. Duration estimated.	< 0.014 g
IV	During the day felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	0.014–0.039 g
V	Felt by nearly everyone, many awakened. Some dishes and windows broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles may be noticed. Pendulum clocks may stop.	0.039–0.092 g
VI	Felt by all, many frightened and run outdoors. Some heavy furniture moved; and fallen plaster or damaged chimneys. Damage slight.	0.092–0.18 g
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.	0.18–0.34 g
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.	0.34–0.65 g
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.	0.65–1.24 g
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.	> 1.24 g
XI	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.	> 1.24 g
XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.	> 1.24 g

[a] g (gravity) = 980 centimeters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

SOURCE: Bolt, 1988 and California Geological Survey, 2003.

the Calaveras fault, a similar type fault that extends north to Suisun Bay. Historically, the Hayward fault generated two sizable earthquakes, both in the 1800s. The USGS Working Group on California Earthquake Probabilities estimates there is a 27 percent chance the Hayward–Rodgers Creek Fault System will experience an earthquake of M 6.7 or greater in the next 30 years (USGS, 2003). Two active traces of the Hayward Fault are close to, but not on, the project site; the nearest ("Main Trace") is approximately 350 feet downslope, west of the western edge of the proposed Building 49 footprint, while the West Trace is located an additional 100 to 150 feet west (HLA, as cited in Fugro, 2002c).

San Andreas Fault Zone

The San Andreas Fault Zone is the largest in the state, extending from the Salton Sea in Southern California near the border with Mexico to north of Point Arena, where the fault trace extends out into the Pacific Ocean. The main trace of the San Andreas Fault through the Bay Area trends northwest through the Santa Cruz Mountains and the eastern side of the San Francisco Peninsula. As the principal strike-slip boundary between the Pacific plate to the west and the North American plate to the east, the San Andreas is often a highly visible topographic feature, such as between the City of Half Moon Bay and I-280, where Crystal Springs Reservoir and San Andreas Lake clearly mark the rupture zone.

The San Andreas Fault Zone was the source of the two major seismic events in recent history that resulted in widespread damage throughout the San Francisco Bay region: the 1906 San Francisco earthquake (M 7.9), and the more recent 1989 Loma Prieta earthquake (M 7.1). The USGS Working Group on California Earthquake Probabilities recently estimated there is a 21 percent chance of the San Andreas fault experiencing an earthquake of M 6.7 or greater in the next 30 years (USGS, 2003).

GEOLOGIC HAZARDS

SLOPE FAILURE HAZARDS

Ground failure is dependent on the slope and geology as well as the amount of rainfall, excavation, or seismic activities. A slope failure is a mass of rock, soil, and debris displaced down a slope by sliding, flowing, or falling. Steep slopes and downslope creep of surface materials characterize landslide-susceptible areas. The project site is characterized by steep slopes that historically have been subject to landslides (Fugro, 2002c, 2002b). The project site is located within a CGS Special Hazard Study Zone for earthquake-induced landslides.

SETTLEMENT

Settlement is the depression of the bearing soil when a load, such as that of a building or new fill material, is placed upon it. Soils tend to settle at different rates and by varying amounts depending on the load weight, which is referred to as differential settlement. Areas are susceptible to differential settlement if underlain by compressible sediments, such as poorly engineered artificial fill or the Bay Mud present in the marshland on the San Francisco Bay

margin. Geotechnical borings indicate that site soils likely consist of sandy or silty clays (Fugro, 2002b). As construction of the project would involve extensive grading, differential settlement could affect the proposed project without proper engineering and fill compaction.

EXPANSIVE SOILS

Expansive soils possess a "shrink-swell" characteristic. Shrink-swell is the cyclic change in volume (expansion and contraction) that occurs in fine-grained clay sediments from the process of wetting and drying. Structural damage may occur over a long period of time, usually the result of inadequate soil and foundation engineering or the placement of structures directly on expansive soils. Due to the presence of fine-grained materials (clays) that underlie the project site, expansive soils may be present.

SOIL EROSION

Soil erosion is a process whereby soil materials are worn away and transported to another area, either by wind or water. Rates of erosion can vary depending on the soil material and structure, placement, and human activity. Soil containing high amounts of silt can be easily eroded, while sandy soils are less susceptible. Excessive soil erosion can eventually damage building foundations and roadways. Erosion is most likely to occur on sloped areas with exposed soil, especially where unnatural slopes are created by cut-and-fill activities. Soil erosion rates can be higher during the construction phase. Typically, the soil erosion potential is reduced once the soil is graded and covered with concrete, structures, or asphalt. The steep slopes and very high potential hazards associated with site soils combined with future cut and fill construction activities result in a severe erosion hazard at the project site.

SEISMIC HAZARDS

Seismic hazards include those hazards that could reasonably be expected to occur within LBNL during a major earthquake on any of the Bay Area fault zones, especially the Hayward fault. Some hazards can be more severe than others, depending on the location, underlying materials, and level of ground shaking. Some of the hazards discussed below might not occur after future construction is completed, or would occur with minor consequences.

SURFACE FAULT RUPTURE

Seismically induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake's seismic waves. The magnitude and nature of fault rupture can vary for different faults or even along different strands of the same fault. Surface rupture can damage or collapse buildings, cause severe damage to roads and pavement structures, and cause failure of overhead as well as underground utilities. As a result of the damage, buildings could become uninhabitable, roads could close, and utility service could be disrupted for an undetermined length of time. Future faulting is generally expected along different strands of the same fault (CGS, 1997b). Ground rupture is considered more likely along active faults, which are referenced above.

The project site is located within an Alquist-Priolo Fault Rupture Hazard Zone for the Hayward Fault, as designated through the Alquist-Priolo Earthquake Fault Zoning Act (discussed below) (CGS, 1982).

GROUND SHAKING

Strong ground movement from a major earthquake could affect LBNL during the next 30 years. Earthquakes on the active faults (listed in Table IV.E-1) are expected to produce a range of ground shaking intensities at the project site. Ground shaking may affect areas hundreds of miles distant from the earthquake's epicenter. A major seismic event on any of these active faults could cause significant ground shaking at the site, as experienced during earthquakes in recent history, namely the 1989 Loma Prieta earthquake (ABAG, 2003b).

According to the California Geological Society probabilistic seismic hazard map, peak ground acceleration in the LBNL region could reach or exceed 0.7 g (Peterson, et al., 1999). A probabilistic seismic hazard map represents the severity of ground shaking from earthquakes that geologists and seismologists agree could occur, but has a 90 percent chance of not exceeding in 50 years (an annual probability occurrence of 1 in 475). It is "probabilistic" in the sense that the analysis takes into consideration the uncertainties in the size and location of earthquakes and the resulting ground motions that can affect a particular site, and expresses the probability of exceeding a certain ground motion.[20]

Geotechnical investigations conducted at the nearby Molecular Foundry estimated peak bedrock accelerations of 0.7g from an earthquake on the Hayward Fault and 0.4g from an earthquake on the San Andreas Fault (Kleinfelder, 2002). As a comparison, ground motion during the 1989 Loma Prieta earthquake at the Santa Cruz Mountains epicenter reached 0.64g.

LIQUEFACTION

Liquefaction is a phenomenon whereby unconsolidated and/or near-saturated soils lose cohesion and are converted to a fluid state as a result of severe vibratory motion. The relatively rapid loss of soil shear strength during strong earthquake shaking results in temporary, fluid-like behavior of the soil. Soil liquefaction causes ground failure that can damage roads, pipelines, underground cables, and buildings with shallow foundations. Liquefaction can occur in areas characterized by water-saturated, cohesionless, granular materials at depths less than 40 feet (ABAG, 1996). In addition, liquefaction can occur in unconsolidated or artificial fill sediments located in reclaimed areas along the margin of San Francisco Bay. The depth to groundwater influences the potential for liquefaction in this area; the shallower the groundwater, the higher potential for liquefaction. Liquefaction potential is highest in areas underlain by Bay fills, Bay Mud, and unconsolidated

[20] The CGS probabilistic seismic map for 10 percent probability of exceedance in 50 years represents ground motions that geologists and seismologists do not think will be exceeded in the next 50 years. This probability level of ground shaking is used for formulating building codes and designing buildings in highly active seismic areas, allowing engineers to design buildings for larger ground motions that geologists and seismologists think will occur during a 50-year interval, which makes buildings safer than if there were only designed for the ground motions that are expected to occur. Seismic shaking maps are prepared using consensus information on historical earthquakes and faults (Peterson et al., 1999).

alluvium. The project site has not been designated as a liquefaction Seismic Hazard Zone for liquefaction (CGS, 2003). Due to the project site conditions of stiff clays and shallow sandstone rock, geotechnical investigations at the Building 49 site concluded the potential for liquefaction at the is very low (Fugro, 2002a).

EARTHQUAKE-INDUCED SETTLEMENT

Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid rearrangement, compaction, and settling of subsurface materials (particularly loose, non-compacted, and variable sandy sediments). Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). Areas are susceptible to differential settlement if underlain by compressible sediments, such as poorly engineered artificial fill or Bay Mud. Due to site subsurface conditions, as summarized above, the Building 49 site is not anticipated to be impacted by earthquake-induced settlement (Fugro, 2002a).

Tsunami

Tsunamis (seismic sea waves) are long period waves that are typically caused by underwater disturbances (landslides), volcanic eruptions, or seismic events. Areas that are highly susceptible to tsunami inundation tend to be located in low-lying coastal areas such as tidal flats, marshlands, and former bay margins that have been artificially filled but are still at or near sea level. As the project site is located, at a minimum, 570 feet amsl, tsunami hazards are remote.

Seiche

A seiche is a free or standing wave oscillation(s) of the surface of water in an enclosed or semi-enclosed basin, such as San Francisco Bay, that may be initiated by an earthquake.[21] The project site is not located near an enclosed or semi-enclosed water body, and the hazard of seiche waves is remote.

REGULATORY ENVIRONMENT

1987 LBNL LRDP

The perimeter of the Laboratory is designated as open space that preserves the natural beauty of the area and acts as a buffer between LBNL and the UC Campus, the nearby residential areas, the Lawrence Hall of Science, and the UC Botanical Garden. Buffer areas are managed with the following objectives:

- Maintain esthetic and environmental values;
- Stabilize slopes and manage rainwater runoff;
- Reduce fire hazards; and
- Visually screen facilities, roadways and parking areas.

[21] The 'sloshing' produced by seiches within enclosed water bodies commonly occurs during earthquakes on a small-scale in swimming pools.

Landscape planting areas are established throughout the Laboratory grounds to sustain or augment the shrub, grassland, and forest areas of the Laboratory. Major landscaping goals are to:

- Complement the hillside setting;
- Unify the site visually;
- Relate the site to adjacent vegetation of the Berkeley Hills;
- Prevent erosion;
- Provide amenities to users of the site; and,
- Provide a buffer between functional areas, building and adjacent properties.

The 1987 LRDP also includes Design Guidelines that were developed to achieve specific facilities planning requirements while respecting site constraints and providing coherence among building elements and the landscape. The guidelines provide a general framework for facilities design and are intended to be augmented by more-detailed landscape plans that identify criteria for suitable building sites and that further clarify landscape planting form. The guidelines generally address: open space and outlooks; landscaping and visual enhancement; topography and grading; utilities corridors; building mass and orientation; building exteriors; building flexibility; energy and operational efficiency; circulation and parking; and provide a guideline review process for future development onsite.

University of California Seismic Safety Policy

University Policy on Seismic Safety

On January 17, 1995, the University adopted and updated "Policy on Seismic Safety." This establishes that University policy is "to acquire, build, maintain, and rehabilitate buildings and other facilities which provide an acceptable level of earthquake safety." The level of safety is also defined in the University policy.

- *New Buildings and Other Facilities*. The design of new buildings shall, at a minimum, comply with the current provisions of Chapter 23 of the California Building Code, or local seismic requirements, whichever is more stringent. Provisions shall also be made for adequate anchoring of nonstructural building elements. No new University structures may be constructed on the trace of a known active fault. All plans shall be reviewed by a consultant structural engineer who must, prior to release of funds, certify that the structure complies with the University Policy on Seismic Safety.

The project would also be required to comply with the University's Seismic Safety Policy for Leased Buildings as the project also involves a facility lease between a third-party developer and the University.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (formerly the Alquist-Priolo Special Studies Zones Act), signed into law in December 1972, requires the delineation of zones along active faults in California. The purpose of the Alquist-Priolo Act is to regulate development on or near fault traces to reduce the hazard of fault rupture and to prohibit the location of most structures for human occupancy across these traces. Cities and counties must regulate certain development

projects within the zones, which includes withholding permits until geologic investigations demonstrate that development sites are not threatened by future surface displacement (Hart, 1997). Surface fault rupture is not necessarily restricted to the area within a Fault Rupture Hazard Zone, as designated under the Alquist-Priolo Act. As noted, the project site is located within an Alquist-Priolo Earthquake Fault Zone.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was developed to protect the public from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and from other hazards caused by earthquakes. This act requires the State Geologist to delineate various seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones. Before a development permit is granted for a site within a Seismic Hazard Zone, a geotechnical investigation of the site must be conducted and appropriate mitigation measures incorporated into the project design. Geotechnical investigations conducted within Seismic Hazard Zones must incorporate standards specified by CGS Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards (CGS, 1997c). The project site has been designation as a Seismic Hazard Zone for earthquake-induced landslides by the CGS.

California Building Code

The California Building Code is another name for the body of regulations known as the California Code of Regulations (CCR), Title 24, Part 2, which is a portion of the California Building Standards Code (CBSC, 1995). Title 24 is assigned to the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under state law, all building standards must be centralized in Title 24 or they are not enforceable (Bolt, 1988).

Published by the International Conference of Building Officials, the Uniform Building Code (UBC) is a widely adopted model building code in the United States. The California Building Code incorporates the UBC by reference and includes necessary California amendments. These amendments include criteria for seismic design. About one-third of the text within the California Building Code has been tailored for California earthquake conditions (ICBO, 1997). The 1997 UBC requires extensive geotechnical analysis and engineering for grading, foundations, retaining walls, and structures, with the nature and degree of analysis and engineering differentiated by zones. Berkeley and the greater San Francisco Bay Area are located within Zone 4, which, of the four seismic zones designated in the United States, is expected to experience the greatest effects from earthquake ground shaking and therefore has the most stringent requirements for seismic design.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The potential exposure of LBNL projects to unstable geologic and soil conditions would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the state CEQA *Guidelines* and the UC CEQA Handbook:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault (Refer to Division of Mines and Geology Special Publication 42);
  - Strong seismic ground shaking;
  - Seismic-related ground failure, including liquefaction; or,
  - Landslides.
- Result in substantial soil erosion or the loss of topsoil;
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property;
- Have soils incapable or adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water; and
- Exceed an applicable LRDP or Program EIR standard of significance.

The following relevant impacts, resulting from exposure to unstable geologic or soil conditions, have been anticipated and analyzed pursuant to CEQA, as part of the programmatic 1987 LRDP EIR, as amended, from which this analysis is tiered:

Impact III-B-1:	There could be significant impacts on people or property due to continued operation and the development of LBNL facilities in areas susceptible to surface rupture. There may be potential adverse impacts to people and property at the site caused by groundshaking, landsliding, lurching, and differential compaction during a seismic event.
Impact III-B-2:	Soil erosion, sedimentation and landsliding caused by construction work may adversely affect the stability of LBNL buildings placed on the site.

Cumulative Impacts:	No significant adverse cumulative impacts upon people or property are anticipated in or in the vicinity of LBNL as a result of geologic and/or soils hazards.

As a result of anticipated exposure to geologic and/or unstable soil conditions, the following mitigation measures, adopted as part of the 1987 LRDP EIR, as amended, are already required for the Proposed Project, and are therefore part of the Proposed Project's description:

Mitigation Measure III-B-1:	Geologic and soils studies will be undertaken during the design phase of each LBNL building project. Recommendations contained in those studies would be followed to ensure that the effects of landsliding, lurching, and liquefaction potential will not represent a significant adverse impact during a seismic event.
Mitigation Measure III-B-2a:	Excavation and earth moving will be designed for stability, and accomplished during the dry season when feasible. Drainage will be arranged to minimize silting, erosion, and landsliding. Upon completion, all land will be restored, covering exposed earth with planting.
Mitigation Measure III-B-2b:	Foundations for proposed structures will be designed in accordance with geologic and soils engineering recommendations to minimize the long-term possibilities of landslide.
Mitigation Measure III-B-2c:	Excavations will be shored as required by law to preclude minor short-term landslides during construction.
Mitigation Measure III-B-2d:	Revegetation of disturbed areas, including slope stabilization sites, using native shrubs, trees, and grasses will be included as part of all new projects.

EXCAVATION, GRADING, AND CONSTRUCTION IMPACTS

Impact E.1: Construction of the proposed project, including earthmoving activities such as excavation and grading, could result in soil erosion. (Less than Significant)

Excavation, grading, and construction activities associated with construction of Building 49 would require the removal and fill of up to about 26,000 cubic yards of soil. This soil would be removed from the Laboratory, and hauled to an off-site location for use as clean fill.

A site and project-specific erosion control plan would be included as part of the project design process and implemented as a condition for approval. This plan would include, as part of the proposed project, Mitigation Measures III-B-2a, III-B-2d, and III-C-2[22] from the 1987 LRDP EIR, as amended, and development of a site-specific Stormwater Pollution Prevention Plan

[22] LRDP EIR, as amended, Mitigation Measure III-C-2 is included in Section IV.G, Hydrology and Water Quality, of this document.

(SWPPP). The SWPPP would include, as feasible, the covering of excavated materials, installation of silt traps, fencing, and use of filter fabric as measures to control erosion and sedimentation as required by the California Construction General Permit, discussed in IV.G, Hydrology and Water Quality, of this document. Landscaping would then begin as soon as surface disturbances were finished for each relevant area. Potential soil erosion hazards associated with the proposed project would therefore be less than significant.

OPERATIONS IMPACTS

The project site is located with a CGS designated Alquist-Priolo Earthquake Fault Zone (A-P Zone) for the northern segment of the Hayward Fault, one of the major active faults in the San Andreas System. The eastern limit of the A-P Zone passes through LBNL upslope and northeast of the proposed facilities (CGS, 1982).

As required by the Alquist-Priolo Act, a Fault Rupture Hazard Investigation was conducted for proposed Building 49 (Fugro, 2002c). This Investigation incorporated multiple elements, such as a literature review of available geologic and fault investigation reports conducted in the project area, review of aerial photographs, and a subsurface field investigation (Fugro, 2002c). Previous fault investigations have indicated that two active traces of the Hayward Fault in the area of Building 49 have been identified. The Main Trace is located approximately 350 feet downslope, west of the western edge of the proposed Building 49 footprint, while the West Trace is located an additional 100 to 150 feet west (HLA, as cited in Fugro, 2002c). The subsurface investigation consisted of exploration trenches around the proposed Building 49 location, with trenches placed 50 feet back from the building footprint and in alignment with known active fault traces and the A-P Zone boundaries in order to "intercept" potential fault projections onto the proposed site. No fault-related features were identified during this field investigation. The Fault Rupture Hazard Investigation concluded that surface fault rupture issues would not impact the proposed facility.

Mitigation: None required.

Impact E.2: The proposed project would expose people or structures to seismic hazards such as groundshaking and earthquake-induced landsliding or settlement. (Less than Significant)

The proposed project is located in the San Francisco Bay Area, which, due to the presence of the San Andreas Fault System, is a region of significant seismic activity. Recent studies sponsored by the United States Geological Survey (USGS) estimate that there is a 67 percent likelihood of a Richter magnitude 6.7 or higher earthquake occurring in the Bay Area in the next 30 years. The project site could experience a range of groundshaking effects during an earthquake on one of the active earthquake faults in the San Francisco Bay Area. Excessive ground shaking could also cause secondary ground failures such as seismically-induced landslides and differential settlement that could expose people to the risk of injury and cause structural damage to buildings.

Due to its close proximity to the project site, the Hayward Fault is likely to generate the most significant levels of groundshaking. Groundshaking intensities from a major seismic event on the Hayward Fault could generate ground motion approaching or exceeding a Peak Ground Acceleration of 0.7g. Additionally, the project site is located within a CGS-designated Seismic Hazard Zone for earthquake-induced landslides. As required by the Seismic Hazard Mapping Act, discussed above, geotechnical investigations and mitigation measures must meet CGS Special Publication 117 guidelines for evaluating seismic hazards. The proposed project includes these project design features as required by Mitigation Measures III-B-1, III.B-2a, and III-B-2b in the 1987 LRDP EIR, as amended.

The proposed project would comply with requirements of the 1998 California Building Code, LBNL's Facilities Department Project & Design Management Procedures Manual "Lateral Force Design Criteria," and federal standards. In addition, the seismic design of the project would comply with the latest UC seismic Safety policies. The design would exceed the requirements of the California Building Code (CCR Title 24) and comply with the more stringent local building code (LBNL Standard RD 3.22). An engineering analysis report and drawings, and relevant grading or construction activities on the project site, would be required by 1987 LRDP EIR, as amended, Mitigation Measure III-B2a to address constraints and incorporate recommendations identified in the geotechnical investigations.

Earthquakes and groundshaking in the Bay Area are unavoidable and expected to occur at some time during the life of the project. Although some structural damage is typically not avoidable, building codes and local construction requirements have been established to protect against building collapse and major injury during a seismic event. Considering that the proposed project would be constructed in conformance with the California Building Code, LBNL requirements, and federal regulations and guidelines, the risks of injury and structural damage from groundshaking and earthquake-induced landsliding or settlement would be reduced and the impacts would be less than significant.

Furthermore, as described in the Project Description, the proposed Building 49 would not result in an increase in daytime population on the LBNL grounds. Instead, the building would be occupied by existing staff who would be relocated from other LBNL facilities, some of which were constructed in compliance with less stringent building code requirements than those that would apply to Building 49. In this regard, construction of the new building would result in a beneficial impact with regard to seismic safety.

Mitigation: None required.

Impact E.3: The proposed project would expose people or structures to geologic hazards such as settlement and expansive soils. (Less than Significant)

The proposed project involves extensive excavation and grading of the project site. Expansive soils or settlement could damage proposed structures without proper geotechnical engineering.

As discussed under Impact E.3, an engineering analysis report and drawings, and relevant grading or construction activities on the project site, would be required by Mitigation Measure III-B2a in the 1987 LRDP EIR, as amended, to address constraints and incorporate recommendations identified in the geotechnical investigations. The project design would incorporate foundation recommendations of the project geotechnical evaluation, in accordance with 1987 LRDP EIR, as amended, Mitigation Measure III-B-2b, so as to be constructed to applicable California Building Code and LBNL standards. Considering that the proposed project would be constructed in conformance with the California Building Code and LBNL requirements and guidelines, the risks of injury and structural damage from expansive soils and settlement would be reduced and the impacts would be less than significant.

Mitigation: None required.

CUMULATIVE IMPACTS

Impact E.4: The proposed project, when combined with other proposed on-site LBNL and nearby development, including the Molecular Foundry, would not result in significant adverse geologic and soils impacts. (Less than Significant)

As noted in the 1987 LRDP EIR, as amended, no significant adverse cumulative impacts upon people or property are anticipated in or in the vicinity of LBNL as a result of geologic and/or soils hazards. Although growth anticipated in the 1987 LRDP EIR, as amended, as well as other growth in the region, would expose greater numbers of people to earthquake hazards, new structures would be built to current seismic design standards and would, in general, be safer than existing structures – particularly older buildings. This would serve to reduce earthquake-induced and other geologic and soils hazards to the maximum practicable extent. Therefore, none of the other projects identified in this EIR at LBNL, the City of Berkeley, or on the UC Berkeley campus would add to a significant geology, soils, or seismicity-related cumulative impact in concert with the proposed project.

Mitigation: None required.

SUMMARY OF IMPACTS AND MITIGATION MEASURES

As noted in the discussion above, under the 1987 LRDP EIR, as amended, the proposed project would not exceed the Standards of Significance established for environmental effects related to geology and soils.

Potentially significant impacts not mitigated by 1987 LRDP EIR, as amended, mitigation measures: None. The proposed project would incorporate 1987 LRDP EIR, as amended,

Mitigation Measures III-B-1, III-B-2a, III-B-2b, III-B-2c, and III-B-2d. As a result, no significant geologic or soils impacts would result from the proposed project.

Building 49 Project-Specific Mitigation Measures: None required.

F. HAZARDS AND HAZARDOUS MATERIALS

INTRODUCTION

As more fully described in the 1987 LRDP EIR, as amended, potential exposure to hazards and hazardous materials could result from continued University operation of LBNL, including continued facility development as contemplated in the 1987 LRDP.

The proposed project consists of offices and building support activities that would use hazardous chemicals common in other office and support settings including familiar materials such as toners, correction fluid, paints, lubricants, kitchen and restroom cleaners, and other maintenance materials. Because general office and household hazardous materials are generally handled in small quantities and because the health effects associated with them are generally not as serious as industrial uses, implementation of the proposed project would not cause an adverse effect on the environment with respect to the use, storage, or disposal of general office and household hazardous substances generated from proposed office and support building uses.

This section discusses existing hazards and hazardous materials at the project site and analyzes the potential for the project to increase the use, generation, and disposal of or exposure to hazards and hazardous materials, focusing on the existing site conditions and proposed nature of laboratory activities. The characteristics of the site and surrounding areas are discussed briefly.

SETTING

HAZARDS AND HAZARDOUS MATERIALS

Vicinity of Site

LBNL is located on 200 acres in the eastern hills of Berkeley and Oakland, and is surrounded by open space, institutional uses, and residential and neighborhood commercial areas. The project site is located entirely within the City of Berkeley, between Blackberry and Strawberry Canyons. West and southwest of the site is the University of California, Berkeley campus, characterized by a variety of buildings, open space, student parking areas, and mature landscaping. Specifically, the project site is located uphill and across Cyclotron Road from student housing, the Greek Theater, and Stern and Bowles Halls. Memorial Stadium and other University buildings are located further southwest. Also to the west and northwest of the site are residential neighborhoods and a small commercial area located in the City of Berkeley.

To the north of the project site is the Building 65 complex, as well as the vegetated, steep slopes of Blackberry Canyon. Further north across the canyon lies LBNL's Building 90 complex, characterized by a mix of semi-permanent portable offices and larger concrete block structures. To the east of the project site is the Building 50 and 70 complexes, East Road, and Building 54 (the LBNL cafeteria). To the south and southeast of the project site are Tilden Regional Park and Claremont Canyon Regional Preserve. These large open space areas are characteristically heavily

vegetated with eucalyptus, oak, and other deciduous trees, and include mostly unpaved trails and open field areas.

Numerous hazardous materials, including radioactive materials, volatile organic compounds, acids, solvents, and petroleum products are used within LBNL. Historic hazardous materials use at LBNL has resulted in soil and groundwater contamination in portions of the facility.

Project Site

The proposed Building 49 site is located on an undeveloped steep slope, north of Cyclotron Road, and immediately northwest of LBNL's Blackberry Canyon entrance. There is no history of hazardous materials processing, storage, or disposal on the project site. Historic and on-going hazardous material use elsewhere at LBNL has not affected soil and groundwater underlying the site (Javandel, 2002).

FIRE HAZARDS

The degree of fire hazard for an area is dependent on three major components: (1) the natural setting of the wildland or urban area, (2) the degree of human use and occupancy of the wildland or urban area, and (3) the level and ability of public services to respond to fires that do occur. Dense stands of vegetation mixed with steep topography and long, dry summers create the potential for wildland fires.

The devastating Oakland–Berkeley Hills Fire of October 1991 illustrates the dangers that can occur in steep wooded canyons with highly flammable vegetation: 1,520 acres burned, 25 people were killed, and 3,469 houses and apartments were damaged or destroyed, with losses totaling approximately $1.5 billion (Oakland Office of Fire Services, 1992). Over 400 fire companies from throughout the state of California were called to assist in extinguishing the fire which burned for four days (City of Berkeley Fire Department, 2003).

The proposed project is located near the northeastern[23] perimeter of the UC Berkeley campus that encompasses the Oakland and Berkeley Hills, and Strawberry and Blackberry Canyons. These hills are wooded with native canyon stands of oak and California bay or with introduced plantations of eucalyptus or conifers. At the project site, the greatest potential for fire hazard exists from the extensive natural vegetation both within and surrounding LBNL.

Fire protection services for the project site are provided by the LBNL, which maintains its own on-site fire department and emergency medical services, along with hazardous response personnel. In addition, LBNL maintains a mutual-response agreement with the City of Berkeley to provide additional support during the summer fire season and in the event of a hillside wildfire.

[23] This analysis incorporates true compass directions.

REGULATORY ENVIRONMENT

1987 LBNL LRDP

The perimeter of the Laboratory is designated as open space that preserves the natural beauty of the area and acts as a buffer between LBNL and the UC Campus, the nearby residential areas, the Lawrence Hall of Science, and the UC Botanical Garden. Buffer areas are managed with the following objectives:

- Maintain esthetic and environmental values;
- Stabilize slopes and manage rainwater runoff;
- Reduce fire hazards; and
- Visually screen facilities, roadways and parking areas.

Landscape planting areas are established throughout the Laboratory grounds to sustain or augment the shrub, grassland, and forest areas of the Laboratory. Major landscaping goals are to:

- Complement the hillside setting;
- Unify the site visually;
- Relate the site to adjacent vegetation of the Berkeley Hills;
- Prevent erosion;
- Provide amenities to users of the site; and,
- Provide a buffer between functional areas, building and adjacent properties.

The 1987 LRDP also includes Design Guidelines that were developed to achieve specific facilities planning requirements while respecting site constraints and providing coherence among building elements and the landscape. The guidelines provide a general framework for facilities design and are intended to be augmented by more-detailed landscape plans that identify criteria for suitable building sites and that further clarify landscape planting form. The guidelines generally address: open space and outlooks; landscaping and visual enhancement; topography and grading; utilities corridors; building mass and orientation; building exteriors; building flexibility; energy and operational efficiency; circulation and parking; and provide a guideline review process for future development onsite.

Hazardous Materials and Waste

Hazardous materials are substances with certain physical properties that could pose a substantial present or future hazard to human health or the environment when improperly handled, disposed of, or otherwise managed. Hazardous materials are grouped into the following four categories, based on their properties: toxic (causes human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials), and reactive (causes explosions or generates toxic gases).[24] Hazardous materials have been and are commonly used in commercial, agricultural, and industrial applications, as well as in residential areas to a limited extent.

[24] Title 22 of the California Code of Regulations, Division 4.5, Chapter 11, Article 3.

A hazardous waste is any hazardous material that is discarded, abandoned, or is to be recycled. The criteria that render a material hazardous also make a waste hazardous.[25] Hazardous materials and wastes can result in public health hazards if released to the soil, groundwater, or air.

Worker Safety

Occupational safety standards exist in federal and state laws to minimize worker safety risks from both physical and chemical hazards in the workplace. The federal Occupational Safety and Health Administration is responsible for assuring worker safety in the workplace. For Department of Energy (DOE) facilities, such as LBNL, the OSHA worker safety program is administered by DOE pursuant to an agreement with OSHA.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

Potential impacts associated with HVAC emissions are addressed in IV.B, Air Quality, of this document. The potential exposure of LBNL projects to hazards and hazardous materials would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the state CEQA *Guidelines* and the UC CEQA Handbook:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- Create a significant hazard to the public or the environment through reasonable foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school;
- Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment;
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan;
- Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands; and,
- Exceed an applicable LRDP or Program EIR standard of significance.

[25] California Health and Safety Code, Section 25151.

The following relevant and potentially significant impacts, resulting from exposure to hazardous and hazardous materials, have been anticipated and analyzed pursuant to CEQA, as part of the programmatic 1987 LRDP EIR, as amended, from which this analysis is tiered:

Impact IV-K-1:	Continued UC operation of LBNL, including proposed increases in laboratory and facility space, may result in impacts from the increase use of hazardous materials in research, facility construction, and facility maintenance activities.
Impact IV-K-2:	Continued UC operation of LBNL, including proposed increases in laboratory and facility space, is expected to result in the increased generation and discharge of hazardous wastes, including offsite disposal of hazardous, radioactive, and medical wastes, from research, facility construction, and facility maintenance activities.
Impact IV-K-3:	Continued UC operation of LBNL, including proposed increases in laboratory and facility space, will result in the increased transportation of hazardous materials and wastes.
Impact IV-K-5:	Continued UC operation of LBNL, including proposed increases in laboratory and facility space, will result in increased numbers of employees and thus increase the potential for exposure to hazardous or radioactive materials.
Impact IV-K-6:	Continued UC operation of LBNL, including proposed increases in laboratory and facility space, will result in a need to continue emergency preparedness and response programs to minimize impacts which may result from actual or potential release of hazardous materials in the workplace or the environment.
Cumulative Impacts:	No significant cumulative impacts are expected.

As a result of limited exposure to hazards and hazardous materials, the following mitigation measures, adopted as part of the 1987 LRDP EIR, as amended, are already required for the proposed project, and are therefore incorporated as part of the proposed project's description:

Mitigation Measure IV-K-1:	LBNL will prepare an annual self-assessment summary report. The report will summarize environment, health, and safety program activities, and identify any areas where LBNL is not in compliance with laws and regulations governing hazardous materials, hazardous waste, hazardous materials transportation, regulated building components, worker safety, emergency response, and remediation activities.
Mitigation Measure IV-K-2a:	Prior to shipping any hazardous materials to any hazardous waste treatment, storage or disposal facility, LBNL will

confirm that the facility is licensed to receive the type of waste LBNL is proposing to ship to that facility.

Mitigation Measure IV-K-2b: LBNL will continue its waste minimization programs and strive to identify new and innovative methods to minimize hazardous waste generated by LNBL activities.

Mitigation Measure IV-K-3: LBNL will require hazardous waste haulers to provide evidence that they are appropriately licensed to transport the type of wastes being shipped from LBNL.

Mitigation Measure IV-K-5: In addition to implementation of the numerous employee communication and training requirements included in regulatory programs, LBNL will undertake the following additional measures as ongoing reminders to workers of health and safety requirements:

> Posting, in areas where hazardous materials are handled, of phone numbers of LBNL offices, which can assist in proper handling procedures and emergency response information.
>
> Continuing to post "Emergency Response and Evacuation Plans" in all LBNL buildings.
>
> Continuing to post all sinks in areas where hazardous materials are handled with signs reminding users that hazardous wastes cannot be poured down the drain.
>
> Continuing to post dumpsters and central trash collection areas where hazardous materials are handled with signs reminding users that hazardous wastes cannot be disposed of as trash.

Mitigation Measure IV-K-6: LBNL will update its emergency preparedness and response program on an annual basis, and will provide copies of this program to local emergency response agencies and to members of the public upon request.

EXCAVATION, GRADING, AND CONSTRUCTION IMPACTS

Impact F.1: Construction of the proposed project, including all earthmoving activities such as excavation and grading, could expose construction workers or the environment to hazardous materials. (Less than Significant)

Excavation, grading, and construction activities would occur during an approximately 18-month time period and would require the removal and fill of up to about 26,000 cubic yards of soil. Some dewatering may be necessary during project excavation and construction. Excavation on the project site may cause temporary surface seeps which would be managed by temporary dewatering systems. As earlier discussed, soil and groundwater that would be encountered during

construction of the project have not been affected by historic or ongoing hazardous materials use at LBNL. Therefore, exposure of construction workers to contaminated soil or water associated with the proposed project is not anticipated to occur.

Construction activities will likely involve small quantities of hazardous materials such as solvents, paints, and petroleum products. The use of hazardous materials best management practices (BMPs) during construction would be required as part of the proposed project under a Storm Water Pollution Prevention (SWPPP), as discussed in IV.G Hydrology and Water Quality, of this document. Common BMPs include following manufacturers' instructions and securely storing hazardous materials at an appropriate distance from surface water bodies. In addition, construction under the proposed project would be required to comply with all LBNL hazardous materials policies and programs, as detailed in LBNL's existing facility-wide SWPPP. Compliance with existing LBNL policies and the use of BMPs would reduce the potential for spills or leaks of hazardous materials during construction to a less than significant level.

Mitigation: None required.

OPERATIONS IMPACTS

Impact F.2: The project would expose people or structures to wildland fire hazards, but would not impair implementation of or physically interfere with emergency response or evacuation plans. (Less than Significant)

The project would be located in an area that is developed with existing office, administration, and science research buildings, and would incorporate landscaping around the perimeter of the project site. Building 49 would be constructed to meet required safety standards and fire codes. Areas that would be disturbed by construction activities would be replanted per LBNL's Integrated Landscape Management Program, using drought-tolerant native plants. Landscaping details would include fire-resistant ground cover for erosion control. The proposed project would implement existing design guidelines, as described in the 1987 LRDP, and would undergo design review by LBNL architects and engineers prior to construction to ensure project conformance with the guidelines. The project, through incorporation of site-sensitive landscaping and design principles into project design, would be generally consistent with the 1987 LRDP. Furthermore, the project would not substantially increase exposure of people or structures to wildland fire hazards beyond what was anticipated and analyzed in the 1987 LRDP EIR, as amended. (As noted in the project description, the project would not increase employment at LBNL.)

As part of the proposed project, both facilities would be incorporated into LBNL's existing emergency response and evacuation plans, as required by the 1987 LRDP EIR, as amended, Mitigation Measure IV-K-6. Fire truck and emergency services access to the west side of Building 49 would be accommodated from Cyclotron Road. This access would provide sufficient turn-around for emergency vehicles. Fire and emergency vehicle access to the east of the

building would be provided from East Road. The proposed project would not interfere with implementation of LBNL's emergency response or evacuation plans.

Mitigation: None required.

CUMULATIVE IMPACTS

Impact F.3: The proposed project, when combined with other proposed on-site LBNL and nearby development, including the Molecular Foundry, would result in an increased exposure to hazards and hazardous materials. (Less than Significant)

As noted in the setting, the project would not involve the use of hazardous materials, other than common office and household substances. Implementation of the proposed project would not result in significantly increased exposure to hazards and hazardous materials. The Molecular Foundry building would have a similar project-specific result. None of the other projects identified in this EIR at LBNL, the City of Berkeley, or on the UC Berkeley campus would add to a significant cumulative increase in exposure to hazards or hazardous materials with the proposed project.

Mitigation: None required.

SUMMARY OF IMPACTS AND MITIGATION MEASURES

As noted in the discussion above, under the 1987 LRDP EIR, as amended, the proposed project would not exceed the Standards of Significance established for environmental effects related to hazards and hazardous materials.

Potentially significant impacts not mitigated by 1987 LRDP EIR, as amended, mitigation measures: None. The proposed project would incorporate 1987 LRDP EIR, as amended, Mitigation Measures IV-K-1, IV-K-2a, IV-K-2b, IV-K-3, IV-K-5, and IV-K-6. As a result, no significant hazards or hazardous materials impacts would result from the proposed project.

Building 49 Project-Specific Mitigation Measures: None required.

G. HYDROLOGY AND WATER QUALITY

INTRODUCTION

As more fully described in the 1987 LRDP EIR, as amended, potential hydrology and water quality impacts could result from continued University operation of LBNL, including continued facility development as contemplated in the 1987 LRDP.

This section discusses existing surface water and groundwater conditions at the project site and analyzes the potential for the project to alter drainage patterns, increase stormwater runoff rates, adversely affect ground or surface water quality, or decrease groundwater recharge rates to an extent that the groundwater table is lowered. These factors were analyzed based on existing conditions within the Strawberry Creek watershed and at the project site, the extent and nature of construction activities, the proposed facility designs, and future operation of the proposed facilities.

SETTING

HYDROLOGIC SETTING

Surface Water

LBNL is situated in the ridges and drainage areas of Blackberry and Strawberry Canyons in the East Bay Hills within the Strawberry Creek watershed. Surface water flows from the project site and the larger Strawberry Creek watershed are ultimately discharged into San Francisco Bay south of the Berkeley Marina at the terminus of the storm drain system that conveys Strawberry Creek through the City of Berkeley. Building 49 would be located within Blackberry Canyon above Cyclotron Road at the LBNL Blackberry Canyon Entrance.

No drainage swales are located on the Building 49 site, and any stormwater not absorbed by site soils flows downslope into the Cyclotron Road drainage system, which is directed into the North Fork of Strawberry Creek near the Valley Life Sciences Building on the UC campus.

The proposed project would route surface runoff from the Building 49 site into the LBNL storm drain system at points downslope and to the south of the proposed building. Stormwater runoff from the project site would then be intercepted into an existing 24-inch storm pipe located at the east side of Horseshoe Curve. Upgrading or expansion of the existing Cyclotron Road storm drainage system would not occur, as earlier noted.

Groundwater

Depth to groundwater beneath the project site is estimated to vary significantly, and locally "perched" groundwater or seeps may be present. Groundwater was not encountered during geotechnical and fault investigations borings and trenching at the adjacent Building 49 site, but it was noted that previous investigations for Building 50B, located directly upslope, encountered

groundwater at 686 feet above mean sea level (amsl), the proposed fourth floor level of Building 49 (Fugro, 2002a,c), and historic investigations upslope from the project site encountered groundwater at depths ranging from 2 to 25 feet below ground surface (Fugro, 2002b). Geotechnical and fault investigations at the project site took place during the summer months, when groundwater depths are typically lowest.

The proposed project would be located on steep slopes underlain by shallow soils and bedrock. Groundwater flow through bedrock is typically characterized by fracture flow that has slow recharge and yield, while groundwater flow in the drainages is unconfined and fluctuates with seasonal precipitation. The soils which underlie the site allow for rapid to very rapid runoff, as discussed in IV.E Geology and Soils, of this document. The proposed project is located above the East Bay Plain, an alluvial aquifer which supplies groundwater for municipal and industrial use. Although groundwater underlying the project site may represent an area of recharge for the East Bay Plain aquifer, existing conditions at the proposed project site of shallow soils located on steep slopes that permit rapid runoff likely do not allow for substantial levels of groundwater recharge to occur.

TOPOGRAPHIC SETTING

The Building 49 site is located on a currently undeveloped south-facing steep slope with an average inclination of 2:1 (horizontal to vertical), east of Cyclotron Road, and immediately northwest of LBNL's Blackberry Canyon entrance gate. Existing elevations at the Building 49 site vary between approximately 710 and 630 feet above mean sea level (amsl) (Fugro, 2002a).

FLOODING

The San Francisco Bay Area has a Mediterranean climate with cool, wet winters and dry, hot summers. LBNL receives approximately 30 inches of precipitation annually, the majority of which (90 percent) occurs between November through April (LBNL, 2002). The project site does not lie within the 100-year flood plain as determined by the Federal Emergency Management Agency (FEMA) flood hazard mapping, and would not include the construction of housing (ESRI-FEMA, 2003). There are no impounded water bodies upstream from the project site, and therefore flooding associated with failure of a dam is not anticipated to affect the project[26].

The proposed project would add up to 15,000 square feet (approximately one-third of an acre) of impervious surface to the project site. This is less than one-half of one percent of the 92-acre Stadium Hill portion of the Strawberry Creek watershed, and an even smaller portion of the total Strawberry Creek watershed area of 585 acres, and of the Strawberry Creek's North Fork subwatershed area of 171 acres. It is anticipated that the drainage system associated with the proposed project would be capable of handling a 25-year storm of 2.5 inches of rain per hour; the capacity of the existing 24-inch pipe to accommodate project-generated runoff would be verified

[26] Potential impacts to the project site associated with flooding from seiches or tsunamis are analyzed as seismic hazards in IV.E Geology and Soils of this document, and were determined to be remote.

as part of project design. Existing maximum 25-year storm water runoff rate in Strawberry Creek at the LBNL is approximately 1,800 cubic feet per second (cfs) (LBNL, 2002).

WATER QUALITY

Within LBNL, the major potential source of storm water pollutants is the use of chemicals in scientific experiments and industrial support operations (LBNL, 2002). Historic and on-going hazardous material use at LBNL has not affected groundwater underlying the project site, as discussed in IV.F Hazards and Hazardous Materials, of this document (Javandel, 2002).

Regionally, stormwater runoff is estimated to contribute more heavy metals to the San Francisco Bay than direct municipal and industrial dischargers, as well as significant amounts of motor oil, paints, chemicals, debris, grease, and detergents. Runoff in storm drains may also include pesticides and herbicides from lawn care products and bacteria from animal waste. Most runoff flows untreated into creeks, lakes, and the Bay. As point sources of pollution have been brought under control, the regulatory focus has shifted to nonpoint sources,[27] particularly urban runoff. Storm water generated within the LBNL facility is currently managed in conformance with LBNL's National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Industrial Activity, as discussed below.

REGULATORY ENVIRONMENT

1987 LBNL LRDP

The perimeter of the Laboratory is designated as open space that preserves the natural beauty of the area and acts as a buffer between LBNL and the UC Berkeley campus, the nearby residential areas, the Lawrence Hall of Science, and the UC Botanical Garden. Buffer areas are managed with the following objectives:

- Maintain esthetic and environmental values;
- Stabilize slopes and manage rainwater runoff;
- Reduce fire hazards; and
- Visually screen facilities, roadways, and parking areas.

Landscape planting areas are established throughout the Laboratory grounds to sustain or augment the shrub, grassland, and forest areas of the Laboratory. Major landscaping goals are to:

- Complement the hillside setting;
- Unify the site visually;
- Relate the site to adjacent vegetation of the Berkeley Hills;
- Prevent erosion;

[27] Point source pollution is defined as pollution from industrial and sewage treatment plants. Nonpoint-source pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. Nonpoint-source pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and man-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even underground sources of drinking water.

- Provide amenities to users of the site; and,
- Provide a buffer between functional areas, building, and adjacent properties.

The 1987 LRDP also includes Design Guidelines that were developed to achieve specific facilities planning requirements while respecting site constraints and providing coherence among building elements and the landscape. The guidelines provide a general framework for facilities design and are intended to be augmented by more detailed landscape plans that identify criteria for suitable building sites and that further clarify landscape planting form. The guidelines generally address: open space and outlooks; landscaping and visual enhancement; topography and grading; utilities corridors; building mass and orientation; building exteriors; building flexibility; energy and operational efficiency; circulation and parking; and provide a guideline review process for future development onsite.

Water Quality Regulation

Regulatory authorities exist on both the state and federal levels for the control of water quality in California. The major federal legislation governing the water quality aspects of the project is the Clean Water Act, as amended by the Water Quality Act of 1987. The objective of the act is "to restore and maintain the chemical, physical, and biological integrity of the nation's waters." The State of California's Porter-Cologne Water Quality Control Act (Division 7 of the California Water Code) provides the basis for water quality regulation within California. The State Water Resources Control Board (SWRCB) administers water rights, water pollution control, and water quality functions throughout the state, while the Regional Water Quality Control Boards (RWQCBs) conduct planning, permitting, and enforcement activities.

State and Regional Water Quality Control Board

The primary responsibility for the protection and enhancement of water quality in California has been assigned by the California legislature to the SWRCB and the nine RWQCBs. The SWRCB provides state-level coordination of the water quality control program by establishing statewide policies and plans for the implementation of state and federal laws and regulations. The RWQCBs adopt and implement water quality control plans that recognize the unique characteristics of each region with regard to natural water quality, actual and potential beneficial uses, and water quality problems.

The project area lies within the jurisdiction of the San Francisco Bay RWQCB, which has adopted the Water Quality Control Plan for the San Francisco Bay Region (Basin Plan) to implement plans, policies, and provisions for water quality management. Beneficial uses of surface waters within the San Francisco Bay Region are described in the Basin Plan and are designated for major surface waters and their tributaries. Beneficial uses of the Central San Francisco Bay include ocean, commercial, and sport fishing, estuarine habitat, industrial service supply, fish migration, fish spawning, navigation, preservation of rare and endangered species, recreation, shellfish harvesting, and wildlife habitat. Strawberry Creek does not have any designated beneficial uses in the Basin Plan.

Both the SWRCB and U.S. Environmental Protection Agency (EPA) Region IX have been in the process of developing new water quality objectives and numeric criteria for toxic pollutants for California surface waters since 1994, when a State court overturned the SWRCB's water control plans containing water quality criteria for priority toxic pollutants. The EPA's draft California Toxics Rule (CTR) was published in the August 5, 1997 Federal Register [62 FR 42159], with the Final Rule recently promulgated on May 18, 2000. The proposed criteria largely reflect the existing criteria contained in the EPA's 304(a) Gold Book (WQ Criteria 1986) and its National Toxics Rule (NTR) adopted in December 1992 [57 Federal Register 60848], and those of earlier state plans (the *Inland Surface Waters Plan* and the *Enclosed Bays and Estuaries Plan* of April 1991, since rescinded). With promulgation of the Final CTR on May 18, 2000, these federal criteria are legally applicable in the State of California for inland surface waters, enclosed bays and estuaries for all purposes and programs under the Clean Water Act.

Total Maximum Daily Load (TMDL) – Section 303d of the Clean Water Act. California has identified waters that are polluted and need further attention to support their beneficial uses. These water bodies are listed pursuant to Clean Water Act Section 303(d), which requires States to identify these polluted waters. Specifically, Section 303(d) requires that each state identify water bodies or segments of water bodies that are "impaired" (i.e., not meeting one or more of the water quality standards established by the state). Approximately 500 waterbodies or segments have been listed in California. Once the water body or segment is listed, the state is required to establish "Total Maximum Daily Load," or TMDL, for the pollutant causing the conditions of impairment. The TMDL is the quantity of a pollutant that can be safely assimilated by a water body without violating water quality standards. Listing of a water body as impaired does not necessarily suggest that the pollutants are at levels considered hazardous to humans or aquatic life or that the water body segment cannot support the beneficial uses. The intent of the 303(d) list is to identify the water body as requiring future development of a TMDL to maintain water quality and reduce the potential for continued water quality degradation.

In accordance with Section 303(d) of the Water Code, the San Francisco Bay RWQCB has identified impaired water bodies within its jurisdiction, the pollutant or stressor impairing water quality, and prioritized the urgency for developing a TMDL. While San Francisco Bay is included on the Section 303(d) list, Strawberry Creek is not. Pollutants or stressors identified on the Section 303(d) list for Central San Francisco Bay include chlordane, dichlorodiphenyltrichloroethane (DDT), diazinon, dieldrin, dioxin compounds, exotic species, furan compounds, mercury, polychlorinated biphenyls (PCBs), PCBs (dioxin-like), and selenium.

Construction Activity Permitting. The San Francisco Bay RWQCB monitors and enforces the NPDES stormwater permitting for the region. The SWRCB administers the NPDES Permit Program through its General NPDES Permit. Construction activities of one acre or more are subject to the permitting requirements of the NPDES General Permit for Discharges of Storm Water Runoff Associated with Construction Activity (General Construction Permit). The project sponsor must submit a Notice of Intent to the SWRCB in order to be covered by the General Permit prior to the beginning of construction. The General Construction Permit requires the preparation and implementation of a stormwater pollution prevention plan (SWPPP), which must

be prepared before construction begins. Components of SWPPPs typically include specifications for best management practices (BMPs) to be implemented during project construction for the purpose of minimizing the discharge of pollutants in stormwater from the construction area. In addition, a SWPPP includes measures to minimize the amount of pollutants in runoff after construction is completed, and identifies a plan to inspect and maintain project BMPs and facilities.

Local Plans and Policies

Alameda County

In Alameda County, stormwater discharge from 17 participating agencies and cities, including the City of Berkeley which ultimately receives runoff generated from within LBNL, is regulated by the Alameda Countywide Clean Water Program (ACCWP) under an NPDES permit issued by the San Francisco Bay RWQCB. The ACCWP has prepared and issued a 2001-2008 Storm Water Management Plan intended to reduce the discharge of pollutants in stormwater to the maximum extent possible and to effectively prohibit non-stormwater discharges into municipal storm drain systems and waterways. The Storm Water Management Plan includes a number of management practices and control techniques to reduce discharge of pollutants in storm water in Alameda County and addresses municipal government activities, new development controls, and storm water treatment. The San Francisco Bay RWQCB recently renewed ACCWP's NPDES Permit on February 19, 2003. This permit renewal included revising Provision C.3 to require on-site treatment and storage of stormwater runoff for development projects that fall under certain use and size characteristics.

LBNL

Storm water generated within the LBNL facility is currently managed in conformance with LBNL's NPDES General Permit for Storm Water Discharges Associated with Industrial Activity (Permit No. 2 01S002421), as required by the Clean Water Act and the State Water Resources Control Board. Oversight and enforcement of this permit is provided by the San Francisco Bay Regional Water Quality Control Board and the City of Berkeley. Implementation of the permit requirements is detailed in LBNL's SWPPP and Storm Water Monitoring Plan (SWMP).

LBNL's SWMP lists potential sources of stormwater contaminants, including a comprehensive list of hazardous substances, chemicals, or other contaminants used throughout the facility. LBNL has implemented multiple source controls (such as containment systems for leak and spill control and maintenance of storm drains and streets to remove organic material and dirt) and management controls (such as preventive maintenance of equipment and the development of spill prevention and response programs) in order to minimize storm water pollutants. However, treatment controls (such as oil-water separators and infiltration basins) are generally not used due to the effectiveness of source and management control measures (LBNL, 2002).

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The impact of LBNL projects on hydrology and water quality would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the state CEQA *Guidelines* and the UC CEQA Handbook:

- Violate any water quality standards or waste discharge requirements;
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted);
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;
- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- Otherwise substantially degrade water quality;
- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;
- Place within a 100-year fold hazard area structures which would impede or redirect flood flows;
- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam;
- Inundation by seiche, tsunami, or mudflow; or
- Exceed an applicable LRDP or Program EIR standard of significance.

The following relevant impacts to hydrology and water quality have been anticipated and analyzed pursuant to CEQA, as part of the programmatic 1987 LRDP EIR, as amended, from which this analysis is tiered:

Impact III-C-1:	LBNL is not located in a flood-plain area. Continued University operation of LBNL, including continued implementation of the 1987 LRDP, is not expected to increase off-site flood hazard, erosion, or sedimentation. The project is not expected to deplete groundwater

resources, interfere with groundwater recharge, or degrade surface or groundwater quality substantially.

Impact III-C-2: Continued University operation of LBNL, including continued implementation of the 1987 LRDP, could produce increased surface and storm runoff.

Cumulative Impacts: Implementation of all hydrology mitigation measures relevant to cumulative development, and compliance with all applicable laws, will result in less than significant impacts on hydrology. However, cumulative development in the City of Berkeley may adversely impact water quality, as well as potentially result in erosion and sedimentation of drainage facilities.

As a result of anticipated hydrological and water quality impacts, the following mitigation measures, adopted as part of the 1987 LRDP EIR, as amended, are already required for the proposed project, and are therefore incorporated as part of the proposed project's description:

Mitigation Measure III-B-2a: Excavation and earth moving will be designed for stability, and accomplished during the dry season when feasible. Drainage will be arranged to minimize silting, erosion, and landsliding. Upon completion, the land will be restored, covering exposed earth with planting.

Mitigation Measure III-B-2d: Revegetation of disturbed areas, including slope stabilization sites, using native shrubs, trees, and grasses, will be included as part of all new projects.

Mitigation Measure III-C-2: Each individual project will continue to be designed and constructed with adequate storm drainage facilities to collect surface water from roofs, sidewalks, parking lots, and other surfaces and deliver it into existing channels which have adequate capacity to handle the flow.

Cumulative Impacts: Potential adverse impacts to water quality can be reduced if LBNL adopts feasible mitigation measures to control surface water runoff, prevent erosion, and maintain adequate drainage facilities.

EXCAVATION, GRADING, AND CONSTRUCTION IMPACTS

Impact G.1: Construction of the proposed project, including earthmoving activities such as excavation and grading, could result in soil erosion and subsequent sedimentation of stormwater runoff or an increase in stormwater pollutants associated with construction-related hazardous materials. (Less than Significant)

Construction-related grading and other activities would be required to comply with the Association of Bay Area Governments' (ABAG) Manual of Standards for Erosion and Sediment

Control Measures (ABAG, 1995) and with the California Stormwater Quality Association (CASQA) Stormwater Best Management Practice Handbook for Construction (CASQA, 2003a). As the proposed project exceeds one acre, application for coverage under the State General Construction NPDES permit and development of a project-specific SWPPP is required. As part of the SWPPP, a project-specific erosion control plan would be included in the project design process, as required by 1987 LRDP EIR, as amended, Mitigation Measure III-B-2a, and implemented during construction to reduce short-term water quality impacts associated with construction. The SWPPP would include the use of BMPs including, as feasible, the covering of excavated materials, installation of silt traps, fencing, and use of filter fabric as measures to control erosion and sedimentation, truck and construction equipment maintenance and storage, construction and hazardous materials storage, housekeeping and prohibition of cement truck washout to LBNL drains and surfaces to minimize pollutants, and oversight throughout construction by LBNL engineers and environmental specialists. In addition, the plan would require disturbed areas to be landscaped and re-seeded at the earliest practical time during construction so that ground cover would be well established by the next rainy season, as required by Mitigation Measures III-B-2a and III-B-2d. Landscaping would begin as soon as surface disturbances are completed for each relevant area.

Excavation, grading, and construction activities associated with construction of Building 49 would require the removal and fill of up to about 26,000 cubic yards of soil, which would be hauled away from the Laboratory and disposed of in an appropriate landfill. Compliance with NPDES permit requirements, which include creation of project-specific SWPPP as discussed above, the 1987 LRDP EIR, as amended, would ensure that potential adverse impacts to surface waters associated with project construction would be less than significant.

Mitigation: None required.

OPERATIONS IMPACTS

Impact G.2: The proposed project would adversely affect stormwater quality. (Less than Significant)

The overall impact of the project would be to incrementally intensify urban uses at the site. Although the project is not anticipated to result in increased vehicular traffic, in that Building 49 would not accommodate an increase in LBNL employment, the new small parking areas at Building 49 would be new sources for collection of vehicle-related pollutants that could contribute to degradation of surface water quality by adversely affecting runoff leaving the site, compared to existing conditions. However, the potential effect of 10 new parking spaces would be so small as to be negligible. Building 49 also could contribute incrementally to pollutant loading. Urban runoff can carry a variety of pollutants, such as oil and grease, metals, sediment, and pesticide residues from roadways, parking lots, rooftops, and other surfaces, and deposit them in adjacent waterways. Pollutant concentrations in urban runoff are extremely variable and are dependent on storm intensity, land use, elapsed time between storms, and the volume of runoff

generated in a given area that reaches a receiving water. The most critical time for urban runoff effects is in autumn under low flow conditions. Pollutant concentrations are typically highest during the first major rainfall event after the dry season, known as the "first flush."

In order to minimize water quality impacts associated with the proposed project, existing pervious surfaces would be preserved to minimize the amount of storm runoff to the greatest extent possible, in accordance with the recommendations provided in the Bay Area Stormwater Management Agencies Association's (BASMAA) *Start at the Source Design Guidance Manual for Stormwater Quality Protection* (BASMA, 1999). Walkways would be paved with interlocking permeable concrete pavement, asphalt, concrete, or Portland cement concrete capable of handling appropriate pedestrian traffic. The entry plazas located on level one and six would be a combination of paved and planted areas. Areas disturbed by the construction would be replanted based on LBNL's Integrated Landscape Management Program. The irrigation system would be designed to apply water as necessary, and moisture sensors would assist in determining the need and duration of irrigation water. The building entries, sitting areas, and outside use areas would be irrigated to assure that specific types of ornamental plants thrive, while over time the majority of the plants throughout the site would be weaned off the irrigation system to allow them to naturalize. The proposed site retaining wall would be designed to accommodate an integrated irrigation and planting system that would substantially cover the wall with drought-tolerant vines within 18 months.

Runoff from the proposed project site is currently directly to the North Fork of Strawberry Creek. Surface runoff from the project site would be routed into the LBNL storm drain system at points downslope and to the south of the proposed building.

To reduce the amount of pollutants entering the storm drain system, and subsequently Strawberry Creek and the San Francisco Bay, the inclusion of the proposed project facilities into LBNL's existing SWPPP and SWMP is part of the proposed project. In addition, the project would be required to meet the provisions of the federal Clean Water Act by submitting plans to the San Francisco Bay RWQCB to eliminate and control potential pollutants in stormwater discharge as discussed in Mitigation Measure G.2, identified below.

Mitigation Measure G.2: LBNL shall prepare and develop design specifications for a Storm Water Design Plan to significantly reduce and where feasible, eliminate, the off-site migration of sediment and storm water pollutants associated with storm water runoff. The Plan shall incorporate existing standards from the LBNL NPDES General Permit for Storm Water Discharges Associated with Industrial Activity and associated SWPPP and SWMP, and subsequent standards developed through the ACCWP and Alameda Countywide NPDES permit, including new C.3 regulations. Runoff from roads and parking lots shall be filtered through mechanical or natural filtration systems to remove oil and grease prior to discharge. LBNL shall also incorporate appropriate source control measures as recommended in the California Storm Water Best Management Practice Handbook for New Development and Redevelopment (CASQA, 2003b), and the LBNL SWPPP and SWMP to minimize the amount of pollutants entering the storm drain system.

Facilities shall be installed within the storm drainage system to provide filtration of stormwater prior to discharge. This can be accomplished through mechanical systems such as pre-manufactured oil water separators or through natural processes such as bioswales and settlement ponds. Due to the steep terrain of the project site, bioswales or settlement ponds are not anticipated to be practicable. Oil and sediment separators or absorbent filter systems shall be designed and constructed to reduce water quality impacts from urban runoff. The performance of the filters shall be monitored regularly in accordance with LBNL's SWPPP to determine the effectiveness of the water treatment.

Commonly used structural and treatment best management practices to reduce sediment and contaminant concentrations include the use of grass strips, high infiltration substrates, and grassy swales to reduce runoff and provide initial stormwater filtration, and the installation of detention basins to allow for infiltration and settling of sediments. The proposed project does not include these features, as stormwater runoff would be directed into the existing Cyclotron Road stormwater drainage system. Additionally, saturation of soils underlying or directly surrounding the proposed project is not recommended by geotechnical reports prepared for the proposed facilities, as referenced in IV.E Geology and Soils of this document, and therefore their inclusion into the proposed project is anticipated to be infeasible.

Compliance with Mitigation Measure G.2 and the LBNL's NPDES permit and associated SWPPP and SWMP would further reduce potential stormwater quality impacts associated with the proposed project to below less than significant levels.

Impact G.3: The proposed project would increase stormwater runoff rates and volumes. (Less than Significant)

Runoff from the proposed project site is currently directly to the North Fork of Strawberry Creek. Surface runoff from the project site would be routed into the LBNL storm drain system at points downslope and to the south of the proposed building. The drainage system associated with the proposed project is anticipated to be capable of handling a 25-year storm of 2.5 inches of rain per hour; as noted in the Setting, the capacity of the system to accommodate project-generated runoff would be verified as part of project design. The greater Strawberry Creek drainage system is sized to handle 100-year storm event flows. Project site flows are carried to the Strawberry Creek drainage system by a 24-inch corrugated metal pipe with a slope of 20 percent. This drainage piping is anticipated to handle 100-year storm event flows. This will be further verified during specific design of the project. Although stormwater runoff rates and volumes are expected to increase from existing conditions, the existing stormwater drainage system which conveys flows from the project site to San Francisco Bay is sized to handle the expected increase in runoff rate and volume. Therefore, potential flooding, erosion, or other adverse impacts associated with increased stormwater runoff generated from the proposed project are considered less than significant**.**

CUMULATIVE IMPACTS

Impact G.4: The proposed project, when combined with other proposed on-site LBNL and nearby development, including the Molecular Foundry, would result in hydrologic or water quality impacts. (Less than Significant)

As noted in the 1987 LRDP EIR, as amended, potential adverse impacts to water quality can be reduced if LBNL adopts feasible mitigation measures to control surface water runoff, prevent erosion, and maintain adequate drainage facilities. Implementation of the proposed project would result in changes to existing drainage patterns, and stormwater runoff rates and volumes. The approved Molecular Foundry building would have a similar project-specific result, although no surface water bodies were channeled into conveyance piping. However, both projects would be required to comply with LBNL's NPDES permit, and associated SWPPP and SWMP, and would not result in flooding or erosion associated with increased stormwater flows. Other projects identified on the UC Berkeley campus and in the City of Berkeley would generally occur incrementally and in different water basins and subbasins. Potential cumulative hydrology and water quality impacts associated with the proposed project are therefore considered less than significant.

Mitigation: None required.

SUMMARY OF IMPACTS AND MITIGATION MEASURES

As noted in the discussion above, under the 1987 LRDP EIR, as amended, with the incorporation of the proposed Mitigation Measures, the proposed project would not exceed the Standards of Significance established for environmental effects related to hydrology and water quality.

The proposed project would incorporate 1987 LRDP EIR, as amended, Mitigation Measures III-B-2a, III-B-2d, and III-C-2.

Potentially significant impacts not mitigated by 1987 LRDP EIR, as amended, Building 49 Mitigation Measure: G.2 has been added to fully mitigate impacts to hydrology and water quality. As a result, no significant hydrology or water quality impacts would result from the proposed project.

Building 49 Project-Specific Mitigation Measures: See Mitigation Measure G.2 presented above.

H. LAND USE AND PLANNING

SETTING

As more fully described in the 1987 LRDP EIR, as amended, potential impacts on land uses could result from continued University operation of LBNL, including continued facility development as contemplated in the 1987 LRDP.

LOCATION AND EXISTING LAND USES

Lawrence Berkeley National Laboratory

The Lawrence Berkeley National Laboratory (LBNL) totals 134 acres, and is located on the hillside above the campus of the University of California, Berkeley. LBNL, which is operated by the University of California under contract to the U.S. Department of Energy, is surrounded by open space, institutional uses, and residential and neighborhood commercial areas. South and southeast of LBNL is the approximately 1,230-acre UC Berkeley campus, a public institution operated and maintained by the University of California, and attended by over 31,800 graduate and undergraduate students. The UC Berkeley campus includes the open space areas of Strawberry Canyon southeast of LBNL. Residential neighborhoods and a small neighborhood commercial area in the City of Berkeley lie to the north and northwest. Regional open space lies to the northeast, including the 2,000-acre Tilden Regional Park. The 205-acre Claremont Canyon Regional Preserve is south of LBNL (see Figure IV.H-1).

Project Site

The project site is part of 200 acres owned by the University of California, most of which are leased to the Department of Energy. The site consists of 1.08 acres on a undeveloped hillside between Cyclotron Road and East Road. The south-facing hillside is adjacent to the Building 50 complex, and northwest of the Building 70 complex, just west of the Blackberry Canyon entrance, within LBNL's Central Research and Administration Area.

EXISTING PLANS AND POLICIES

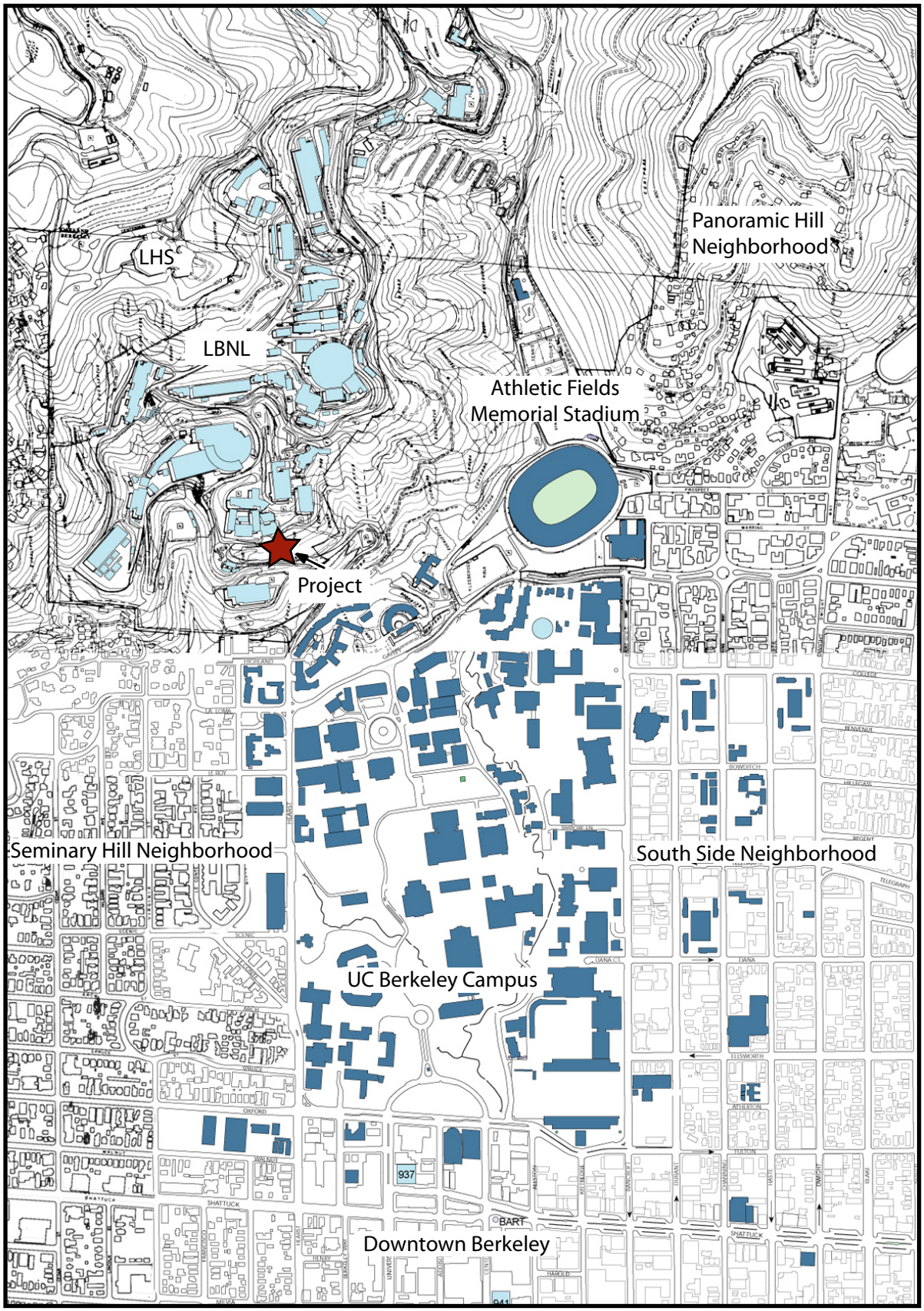
LBNL Long Range Development Plan (LRDP)

The Long Range Development Plan (LRDP) for LBNL was approved by The Regents of the University of California in 1987. The LRDP organizes the LBNL site into seven functional planning areas to consolidate related functions, maximize efficiency, and establish well-planned roadways, pedestrian paths, and parking to minimize hazards to employees and the public. The project site is in the Central Research and Administration Area, which is the "management and information center of the Laboratory" (1987 LRDP, p. 54). This plan reserved some space for future construction, anticipating a future need for a "conference center," as well as some building replacement and additions. Building 49 would be constructed in an area designated for "proposed addition" where new construction is anticipated in the LRDP. According to the 1987 LRDP,

INSERT FIGURE IV.H-1 HERE (LBNL FIGURE)

LAND USE VICINITY MAP

LBNL-SUPPLIED FIGURE



LBNL Building 49 / 202210

LHS -- Lawrence Hall of Science

Figure IV. H-1
Land Use Vicinity Map

"Design guidelines in the LRDP have been developed to achieve specific facilities planning requirements while respecting site constraints and providing coherence among building elements and the landscape." These guidelines address the following areas: open space and outlook, landscaping and visual enhancement, topography and grading, utilities corridors, building mass and orientation, building exteriors, building flexibility, energy and operational efficiency, circulation and parking, and guideline review process.

City of Berkeley General Plan

The Berkeley General Plan is a statement of community priorities developed to guide public decision-making. The Berkeley General Plan land use designations for most of the areas within the University of California lands are Institutional and Open Space. The General Plan land use designation for the project site is Institutional. Institutional areas of Berkeley are for institutional, government, educational, recreational, open space, natural habitat, woodlands, and public service uses and facilities, such as the University of California, BART, Berkeley Unified School District, and East Bay Municipal Utility District facilities. It is General Plan policy that public agencies seek to comply with General Plan policies and local zoning standards. Within these areas, building intensity will generally range from a Floor Area Ratio (FAR) of less than 1 to an FAR of 4. Policy LU-35 states that the City of Berkeley shall "develop and foster close working relationships with the University of California to ensure and facilitate land use decisions that are mutually beneficial to the institution and the adjoining neighborhoods.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The impact of LBNL projects on land use and planning policies would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the state CEQA *Guidelines* and the UC CEQA Handbook:

- Physically divide an established community;
- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (i.e., the LRDP) adopted for the purpose of avoiding or mitigating an environmental effect;
- Conflict with any applicable habitat conservation plan or natural community conservation plan; and
- Exceed an applicable LRDP or Program EIR standard of significance.

The following relevant impacts to land use and planning policies have been anticipated and analyzed pursuant to CEQA, as part of the programmatic 1987 LRDP EIR, as amended, from which this analysis is tiered:

Impact III-G-1:	There are no LBNL-proposed developments in the site development plan which would impact directly on the privately owned multiple-family or single-family housing along the LBNL western and northern boundaries.
Impact III-G-2:	Continued operation of LBNL by the University, including continued implementation of the 1987 LRDP, would result in the conversion of a small amount of open space into urban- or suburban-scale uses.
Impact III-G-3:	Continued operation of LBNL by the University, including continued implementation of the 1987 LRDP, would be consistent with the 1990 UC Berkeley Long Range Development Plan, and the General Plans of the City of Berkeley and the City of Oakland.

As a result of anticipated impacts to land use and planning policies, the following mitigation measure, adopted as part of the 1987 LRDP EIR, as amended, is already required for the proposed project, and is therefore incorporated as part of the proposed project's description:

Mitigation Measure III-G-2:	Buildings proposed for development at LBNL will follow the design guidelines contained in the LBNL LRDP, as amended.

EXCAVATION, GRADING, AND CONSTRUCTION IMPACTS

Impact H.1: Construction of the proposed project would create temporary and intermittent impacts that could affect adjacent land uses. (Less than Significant)

Project construction-related activities that would affect adjacent land uses are discussed in Sections IV.K, *Traffic, Transportation, Circulation, and Parking*, IV.C, *Biological Resources*, IV.G, *Hydrology and Water Quality*, IV.I*, Noise*, and IV.B, *Air Quality*.

As discussed in Chapter III, *Project Description*, construction activities would begin in Spring 2004. Proposed on-site construction would include site grading and fill; installation of new utilities; foundation work; new building construction and finishing; improvement of the street network; and site paving and landscaping improvements.

For additional analysis of construction impacts, please refer to the above-identified sections. Mitigation measures identified in these sections would mitigate all potential construction-associated land use impacts to a less than significant level.

Mitigation: None required.

OPERATIONS IMPACTS

Impact H.2: The proposed project would introduce new office-related uses onto a currently undeveloped LBNL site. (Less than Significant)

The project would construct an office building (Building 49) that would occupy a 1.08-acre site that is undeveloped and located on a south-facing hillside adjacent to the Building 50 complex, and northwest of the Building 70 complex. It would complete a cluster of buildings along East Road, just west of the Blackberry Canyon entrance, within LBNL's Central Research and Administration Area. Activities at the project site would be linked to activities in the Building 50 complex and the Building 70 complex. The proposed project would therefore not divide an established community.

The proposed project site is in the western portion of the LBNL site, within the city limits of Berkeley. Because the land is controlled by a state entity (UC), it is exempt from local zoning and planning regulations. However, it is the policy of the University and LBNL to work cooperatively with local agencies in planning matters to the extent feasible. The City of Berkeley's General Plan designates the area as "Institutional," and therefore, present and proposed uses are consistent with intended uses according to the Berkeley General Plan.

The proposed project would result in additional office space in Building 49 to alleviate current overcrowding in the Building 50 and Building 70 complexes. The Building 49 site is adjacent to both utility corridors and traffic/transit corridors. All support services have adequate capacity to serve the new building at this location. The proposed project is generally consistent with the LRDP's Design Guidelines. The proposed Building 49 would be larger than what was initially anticipated for the particular functional planning area—the Central Research and Administration Area of LBNL; however, these specific area distribution estimates were identified in the LRDP as being for "general estimating purposes only" and were not intended to restrict or promote particular development levels. Therefore, construction of the Building 49 on this site would be generally consistent with the intended implementation of the LBNL LRDP.

Although this building would have a total of six levels, the first level would comprise only a fraction of the building's footprint (see Figure III-6), and would be designed so as to disappear into the building's foundation (see Figure III-8).[28] The second level would be essentially below grade on its northern, eastern, and southern sides (see Figure III-5). The northern half of the building would have neither the first nor the sixth levels of the southern half of the building, and thus would feature only four total floors. The building's highest floor would occupy only the southern half of the building and would be recessed from the building's front (western) face. Due to this placement deep within the sloped site's topography, the building at its highest point would

[28] The principal purpose of this level, which would be at grade on Cyclotron Road, would be to serve as one of two entrances to the building; the other entrance would be at the sixth level, on East Road. Because it is necessary to accommodate the elevators and service core at this level, the Lab has determined that it would be cost-effective to add additional work stations and offices on a small portion of this level, thus effectively creating a sixth occupied level of the building. Because the visible portion of this level would consist of only the building entrance and a small band of glazing at the top of the western row of offices, the entry level would not be a major element of the building design.

be five stories above grade (see Figure III-8) and would not present an uninterrupted wall greater than four stories high.

The northern half of the building would feature four total floors. On the southern half of the building, the lower entry level would be obscured behind retaining walls, and the top floor would be recessed back from the wall face. On the southern half of the building, even the wall itself would be visually broken up at each level with strong horizontal and salient elements—deeply recessed window banks, protruding sun screens, and a sharply curving contour—to minimize the appearance of a sheer or planer wall (see Figure III-8).

Building 49's design and massing would minimize the impact of the building on the visual character of the LBNL site. In addition to its being recessed into the surrounding hillside, building 49 would be set immediately in front of (west of) and below the relatively massive Building 50 complex. As described in Section IV.A, Aesthetics, off-site views of the project would be intermittent and partial at best, and the building would be seen only against the backdrop of the much more visually prominent Building 50 complex.

The LRDP anticipates that growth on the main LBNL site could increase from approximately 1.59 million gross square feet (gsf) in 1987 to approximately 2.0 million gsf at buildout. There are currently about 233,500 gsf available for development under this projection. The proposed Building 49 project would comprise up to approximately 65,000 gsf, which would leave approximately 168,500 gsf remaining to the proposed level of development anticipated in the 1987 LRDP, and analyzed in the 1987 LRDP EIR, as amended.

The LRDP projects that total population growth at LBNL could increase from approximately 2,850 in 1987 to approximately 4,750 at full development under the 1987 LRDP.[29] LBNL is currently about 400 people below the population projection anticipated by the LRDP. Because the proposed project is being built to alleviate overcrowding at adjacent buildings, the proposed Building 49 would result in no net increase to the existing LBNL population level, and therefore would have no effect on the LBNL population level proposed in the 1987 LRDP, and analyzed in the 1987 LRDP EIR, as amended.

Although not yet completed or approved, an update to the 1987 LRDP is in progress and does not conflict with the project. In November 2000, a Notice of Preparation was issued for this forthcoming LRDP and new LRDP EIR. This LRDP would project growth and development at LBNL for approximately the next twenty years; growth in population and in developed space is expected to occur at the same rates as have been occurring at LBNL during the past 15 years—approximately 1.3 percent per year. The draft LRDP and new LRDP EIR are expected to circulate for public review in 2004. The proposed Building 49 project would be reflected and accounted for in the new LRDP and new LRDP EIR.

[29] Because the portion of the LBNL population identified as being located on the UC Berkeley Campus actually circulates regularly between Campus and LBNL main site facilities, aggregate rather than site-specific population figures are used for planning purposes to avoid population undercounting.

No Habitat Conservation Plans or Natural Community Conservation Plans are in effect at the project site or in its immediate vicinity (see Section IV.C, *Biological Resources*, above). The project would therefore not conflict with such plans.

The proposed project would not exceed a Standard of Significance established by the programmatic 1987 LRDP EIR, as amended. Land use and planning impacts would be less than significant with the incorporation of 1987 LRDP EIR, as amended, Mitigation Measure III-G-2. No project-specific mitigation measures would be required.

Mitigation: None required.

CUMULATIVE IMPACTS

Impact H.3: The proposed project, when combined with other proposed onsite LBNL and nearby development, such as the recently approved Molecular Foundry, would result in new land uses in the area. (Less than Significant)

According to the 1987 LRDP EIR, as amended, overall development at LBNL would not adversely impact land use and planning policies relevant to LBNL and its vicinity. Other development identified in this EIR to occur in the City of Berkeley or on the UC Berkeley campus would neither be close enough in proximity or significant enough in land use disruption such that the proposed project would result in a considerable contribution to a cumulative impact. Therefore, none of the other projects identified in this EIR at LBNL, the City of Berkeley, or on the UC Berkeley campus would add to a significant land use or planning cumulative impact in concert with the proposed project.

Mitigation: None required.

SUMMARY OF IMPACTS AND MITIGATION MEASURES

As noted in the discussion above, under the 1987 LRDP EIR, as amended, the proposed project would not exceed the Standards of Significance established for environmental effects related to land use and planning.

Potentially significant impacts not mitigated by 1987 LRDP EIR, as amended, mitigation measures: None. The proposed project would incorporate 1987 LRDP EIR, as amended, Mitigation Measure III-G-2. As a result, no significant land use or planning impacts would result from the proposed project.

Building 49 Project-Specific Mitigation Measures: None required.

I. NOISE

INTRODUCTION

As more fully described in the 1987 LRDP EIR, as amended, potential noise impacts could result from the continued operation of LBNL as well as the continued development at the Laboratory as contemplated in the 1987 LRDP.

This section discusses the existing noise environment in the project area and the regulation of noise, and analyzes the potential for the project to affect ambient noise environment at nearby sensitive receptors. It also analyzes the noise impacts of the project during both construction and over the long-term due to project operation.

SETTING

TECHNICAL BACKGROUND

Sound is mechanical energy transmitted by pressure waves through a medium such as air. Noise is defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level. Sound pressure level is measured in decibels (dB), with zero dB corresponding roughly to the threshold of human hearing, and 120 to 140 dB corresponding to the threshold of pain. Because sound pressure can vary by over one trillion times within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and manageable level.

Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude (sound power). When all the audible frequencies of a sound are measured, a sound spectrum is plotted consisting of a range of frequency spanning 20 to 20,000 Hz. The sound pressure level, therefore, constitutes the additive force exerted by a sound corresponding to the sound frequency/sound power level spectrum.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that de-emphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ear's decreased sensitivity to low and extremely high frequencies instead of the frequency mid-range. This method of frequency weighting is referred to as A-weighting and is expressed in units of A-weighted decibels (dBA).[30] Frequency A-weighting follows an international standard methodology of frequency de-emphasis and is typically applied to community noise measurements.

[30] All noise levels reported herein reflect A-weighted decibels unless otherwise stated.

Noise Exposure and Community Noise

An individual's noise exposure is a measure of the noise experienced by the individual over a period of time. A noise level is a measure of noise at a given instant in time. However, noise levels rarely persist consistently over a long period of time. Rather, community noise varies continuously with time with respect to the contributing sound sources. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with the individual contributors unidentifiable. The background noise level changes throughout a typical day, but does so gradually, corresponding with the addition and subtraction of distant noise sources such as traffic and atmospheric conditions. What makes community noise constantly variable throughout a day, besides the slowly changing background noise, is the addition of short duration single event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual.

These successive additions of sound to the community noise environment vary the community noise level from instant to instant, requiring the measurement of noise exposure over a period of time to legitimately characterize a community noise environment and evaluate noise impacts. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized below:

L_{eq}: The equivalent sound level is used to describe noise over a specified period of time, typically one hour, in terms of a single numerical value. The L_{eq} is the constant sound level which would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).

L_{max}: The instantaneous maximum noise level measured during the measurement period of interest.

L_{min}: The instantaneous minimum noise level measured during the measurement period of interest.

L_x: The sound level that is equaled or exceeded x percent of a specified time period. The L_{50} represents the median sound level (i.e., the noise level exceeded 50 percent of the time).

DNL: The energy average of the A-weighted sound levels occurring during a 24-hour period, accounting for the greater sensitivity of most people to nighttime noise by weighting noise levels at night ("penalizing" nighttime noises). Noise between 10:00 p.m. and 7:00 a.m. is weighted by adding 10 dBA to take into account the greater annoyance of nighttime noises.

CNEL: Similar to the DNL, the Community Noise Equivalent Level (CNEL) adds a 5-dBA "penalty" for the evening hours between 7:00 p.m. and 10:00 p.m. in addition to a 10-dBA penalty between the hours of 10:00 p.m. and 7:00 a.m.

Effects of Noise on People

The effects of noise on people can be placed into three categories:

- subjective effects of annoyance, nuisance, dissatisfaction;
- interference with activities such as speech, sleep, and learning; and
- physiological effects such as hearing loss or sudden startling.

Environmental noise typically produces effects in the first two categories. Workers in industrial plants generally experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise, or the corresponding reactions of annoyance and dissatisfaction. A wide variation exists in the individual thresholds of annoyance, and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting human reaction to a new or changed noise environment is the way the noise levels compare to the existing environment to which one has adapted: the so-called "ambient noise" level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships occur:

- except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived;
- outside of the laboratory, a 3-dBA change is considered a just-perceivable difference;
- a change in level of at least 5 dBA is required before any noticeable change in human response would be expected; and
- a 10-dBA change is subjectively heard as approximately a doubling in loudness, and can cause adverse response.

These relationships occur in part because of the logarithmic nature of sound and the decibel system. The human ear perceives sound in a non-linear fashion; hence, the decibel scale was developed. Because the decibel scale is based on logarithms, two noise sources do not combine in a simple additive fashion, rather logarithmically. For example, if two identical noise sources produce noise levels of 50 dBA, the combined sound level would be 53 dBA, not 100 dBA.

Noise Attenuation

Stationary point sources of noise, including stationary mobile sources such as idling vehicles, attenuate (lessen) at a rate of 6 to 7.5 dBA per doubling of distance from the source, depending on the topography of the area and environmental conditions (i.e., atmospheric conditions and noise barriers, either vegetative or manufactured, etc.). Thus, a noise measured at 90 dBA, 50 feet from the source would be about 84 dBA at 100 feet, 78 dBA at 200 feet, 72 dBA at 400 feet, and so forth. Widely distributed noise, such as a large industrial facility spread over many acres or a street with moving vehicles, would typically attenuate at a lower rate, approximately 4 to 6 dBA per doubling of distance from the source.

REGULATORY CONTEXT

Noise standards are typically addressed in local general plan policies and noise ordinances. The proposed project site is in the southwest portion of LBNL, within the city limits of Berkeley. The University of California and federal facilities such as LBNL are exempt from local zoning and planning regulations. However, both the University and LBNL actively seek to cooperate with local agencies in planning matters to the extent feasible.

The City of Berkeley's General Plan Noise Element contains guidelines for determining the compatibility of various land uses with different noise environments. Generally, the noise level for residential, hotel and motel uses is 60 dBA or less, while conditionally acceptable noise levels range from over 60 dBA to 75 dBA (may require insulation, etc.). Noise levels over 75 dBA are, in general, unacceptable. The City of Berkeley's Community Noise Ordinance sets limits for permissible noise levels during the day and night according to the zoning of the area. If ambient noise exceeds the standard, the ambient noise level becomes the allowable noise level. Areas adjacent to the southwestern portion of LBNL are zoned R-1H, R-2AH, and R-3H[31]. For R-1 and R-2 residential areas, the receiving noise level (not to be exceeded by more than thirty minutes any hour) is 55 dBA from 7:00 a.m. to 10:00 p.m., and 45 dBA from 10:00 p.m. to 7:00 a.m. For R-3 uses and above, the receiving noise level (not to be exceeded by more than thirty minutes any hour) is 60 dBA from 7:00 a.m. to 10:00 p.m., and 55 dBA from 10:00 p.m. to 7:00 a.m.

For construction noise, the Noise Ordinance (Sec. 13.40.070 of the Municipal Code) requires that construction be restricted to the hours of 7:00 a.m. to 7:00 p.m. on weekdays, and the hours of 9:00 a.m. to 8:00 p.m. on weekends and holidays. The Noise Ordinance states that, "where technically and economically feasible," maximum weekday construction noise levels should be controlled so as not to exceed 75 dBA at the nearest properties for mobile equipment and 60 dBA at the nearest properties for stationary equipment, in R-1 and R-2 zoning districts; in the R-3 district, the permitted noise levels are 5 dBA higher. The noise standards are more restrictive on weekends, by 10 dBA for stationary equipment and 15 dBA for mobile equipment.

EXISTING NOISE ENVIRONMENT

Transportation sources, such as automobiles, trucks, trains, and aircraft, are the principal sources of noise in the urban environment. Along major transportation corridors, noise levels can reach 80 DNL, while along arterial streets, noise levels typically range from 65 to 70 DNL. Industrial and commercial equipment and operations also contribute to the ambient noise environment in their vicinities.

The proposed Building 49 site is located on a hillside, between Cyclotron Road and East Road, on the western side of the LBNL site, within the city limits of Berkeley. The site, which is currently undeveloped, is surrounded by other LBNL buildings. The primary sources of noise at

[31] "H" is a Hillside overlay district designed to protect views and the character of Berkeley's hills, and allows modification of lot sizes and building heights when justified by steep topography, irregular lot size, etc. R-2A districts permit small multiple-family and garden-type apartment structures consistent with adjacent areas and with a maximum of open space.

the project site are activities from the operation of the adjacent buildings and noise from the LBNL shuttle buses and other vehicles.

To provide the basis for evaluating potential impacts of the project on the nearest noise-sensitive uses, ESA undertook short-term (15-minute) noise measurements at two locations in residential areas near the project site (see Figure IV.I-1). The first monitoring location is at the Foothill parking lot approximately 500 feet southeast of the project site and approximately 100 feet uphill from the Foothill Student dormitory buildings. The project site is not visible from the parking lot due to the intervening topography. The second short-term measurement was recorded at the northern property boundary of the Tibetan Nyingma Institute approximately 600 feet south and downhill of the Building 49 site. Views of the project site from this location are obstructed by Building 88 and vegetation. The noise environment at this location would be representative of the noise levels at the residences along Highland Place. The noise environment at this location was primarily influenced by traffic (mostly LBNL shuttle buses accelerating uphill) on Cyclotron Road. The monitored data at the two locations are shown in Table IV.I-1.

TABLE IV.I-1
AMBIENT NOISE LEVELS AT MONITORED LOCATIONS, dBA

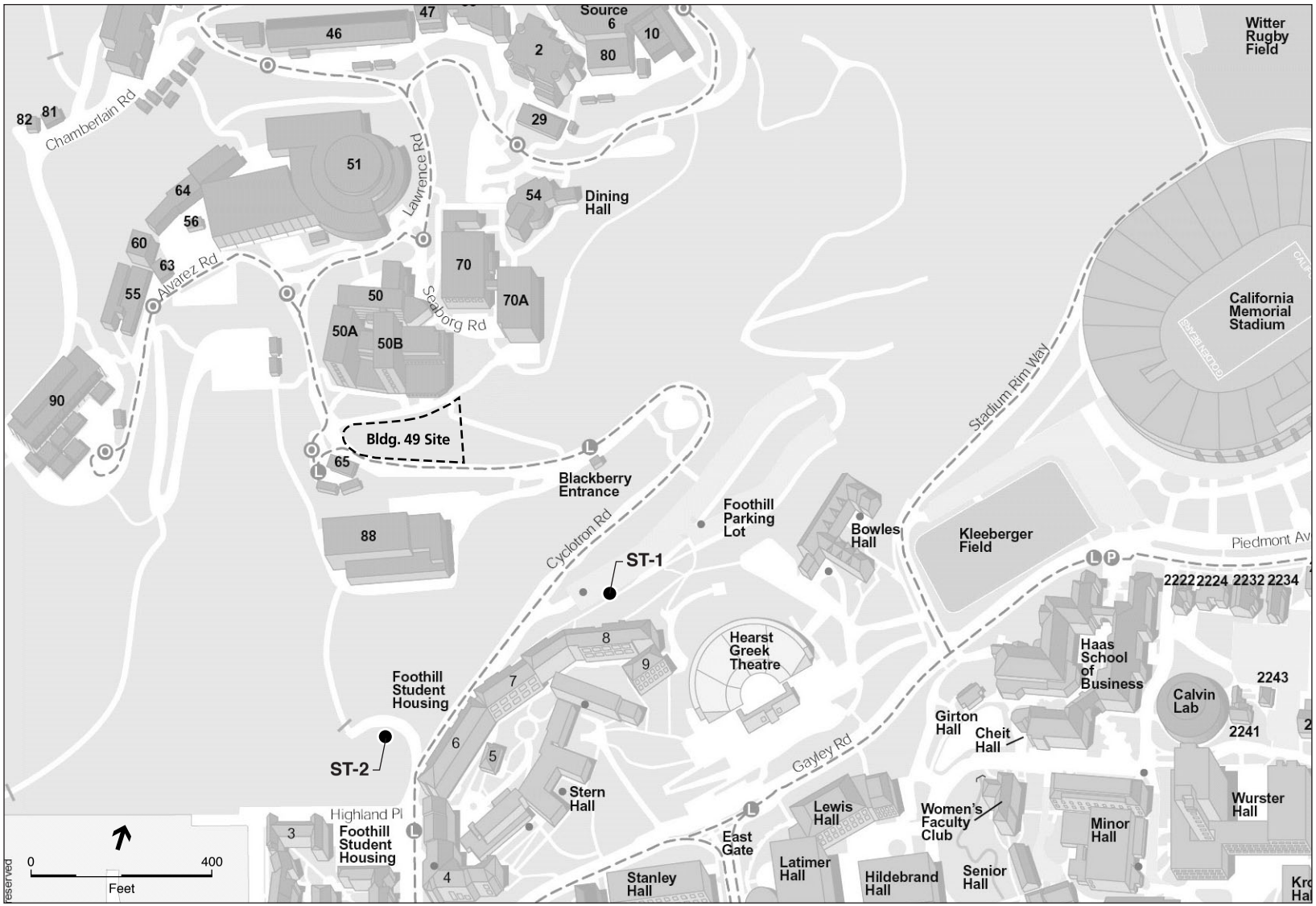
Site[a]	Location	Measurement Period (July 10, 2003)	Noise Level in dBA			
			L_{eq}	L_{max}	L_{10}[b]	L_{90}[c]
ST-1	At Foothill Parking Lot	4.40- 4.55 p.m.	56.5	66.9	58	49
ST-2	At northern boundary of Tibetan Nyingma Institute	5.05- 5.20 p.m.	48.1	57.3	49	46

[a] Locations correspond to those illustrated in Figure IV.I-1.
[b] L10 represents the sound level that is equaled or exceeded 10 percent of the monitored time period.
[c] L90 represents the sound level that is equaled or exceeded 90 percent of the monitored time period.

SOURCE: Environmental Science Associates, 2003

Sensitive Receptors

Some land uses are considered more sensitive to ambient noise levels than others are, due to the amount of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities typically involved. People in residences, motels and hotels, schools, libraries, churches, hospitals, nursing homes, auditoriums, natural areas, parks and outdoor recreation areas are generally more sensitive to noise than are people at commercial and industrial establishments. Consequently, the noise standards for sensitive land uses are more stringent than for those at less sensitive uses.



ST-1 **SHORT-TERM NOISE MEASUREMENT LOCATIONS**

SOURCE: Lawrence Berkeley National Laboratory (2003); ESA (2003)

LBNL Building 49 / 202210 ■

Figure IV.I-1
Noise Measurement Locations

Sensitive receptors in the vicinity of the project site include areas of residential and nearby dormitories associated with the University. The nearest sensitive receptors would be the multi-family residences and the Tibetan Nyingma Institute located approximately 600 feet south of the Building 49 site along Highland Place and the Foothill student dormitories of UC Berkeley located to the approximately the same distance to the southeast along Cyclotron Road.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The noise impacts of LBNL projects on the environment would be considered significant if they would exceed the following Standards of Significance, in accordance with Appendix G of the state CEQA *Guidelines* and the UC CEQA Handbook:

- Exposure of persons to or generation of noise levels in excess of standards established in any applicable plan or noise ordinance, or applicable standards of other agencies;
- Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- For a Project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, exposure of people residing or working in the project area to excessive noise levels (not applicable to the proposed project);
- For a project within the vicinity of a private airstrip, exposure of people residing or working in the project area to excessive noise levels (not applicable to the proposed project); and,
- Exceed an applicable LRDP or Program EIR standard of significance.

The following relevant impacts to noise levels have been anticipated and analyzed pursuant to CEQA, as part of the programmatic 1987 LRDP EIR, as amended, from which this analysis is tiered:

Impact III-K-1:	Ambient noise levels from the University's continued operation of LBNL will generate noise levels which could conflict with applicable noise ordinances and standards.
Impact III-K-2:	Construction activities resulting from continued implementation of the 1987 LRDP could create significant adverse noise impacts on-site.

Impact III-K-3:	Since construction periods are of short term, approximately one to two years for site work and exterior construction, the overall off-site construction noise impacts are not expected to be significant.
Cumulative Impacts:	No cumulative noise impacts are anticipated from anticipated cumulative development at and in the vicinity of LBNL.

As a result of anticipated impacts to noise levels, the following mitigation measures, adopted as part of the 1987 LRDP EIR, as amended, are already required for the proposed project, and are therefore incorporated as part of the proposed project's description.

Mitigation Measure III-K-1:	Projected noise levels will be compared with ambient noise levels and the Berkeley Noise Ordinance limits, or other applicable regulations. Acoustical performance standards would be included in future construction documents. LBNL will continue to design, construct and operate buildings and building equipment taking into account measures to reduce the potential for excessive noise transmission.
Mitigation Measure III-K-2:	Noise-generating construction equipment will be located as far as possible from existing buildings. If necessary, windows of laboratories or offices will be temporarily covered to reduce interior noise levels on-site.

EXCAVATION, GRADING AND CONSTRUCTION IMPACTS

Impact I.1: Construction activities associated with the project would intermittently and temporarily generate noise levels above existing ambient levels in the project vicinity. (Significant)

As stated in the *Project Description*, the proposed LBNL 49 building would be constructed on a site created by cutting and filling up to about 26,000 cubic yards of soil and rock and construction would take place over a period of 18 months from Spring 2004 to Fall 2005. The project would require extensive site preparation that includes excavation, soil compaction, and grading. No blasting would occur. Any building foundation piers would be drilled rather than driven. With the exception of utility extensions to service the building, no utility relocations are anticipated.

Construction noise is a temporary phenomenon, but in this case the project work would extend for about an 18-month period. Construction noise might be heard at offsite receptors, and levels could vary from hour to hour and day to day, depending on the equipment in use, the operations being performed and the noise environment at the receptors. The major noise-producing phases of construction would occur with excavation, building erection (including foundation), and exterior finishing. The foundation would be drilled piers poured in place and would not entail any pile driving.

Construction noise levels at and near locations on the project site would fluctuate depending on the particular type, number, and duration of use of various types of construction equipment. The effect of construction noise would depend upon the noise level (expressed in dBA) generated, the distance between noise sources and the nearest noise-sensitive uses, and the existing noise levels at those uses.

Table IV.I-2 below shows typical noise levels generated by construction of commercial buildings. As shown in Table IV.I-2, the noisiest phases of construction (excavation and exterior finishing) would generate approximately 89 L_{eq} at 50 feet. The main noise sources associated with excavation are the operation of excavators removing material and trucks hauling excavated materials away. The main noise sources associated with exterior finishing would be operation of concrete mixers and pumps for application of stucco material to the building exterior.

As noted in the Setting, noise from construction activity generally attenuates (decreases) at a rate of 6 to 7.5 dBA per doubling of distance. Conservatively assuming an attenuation of 6 dBA per doubling of distance[32], building construction noise during the noisiest phases of construction (89 L_{eq} at 50 feet) would generate noise levels of approximately 67 L_{eq} at the nearest sensitive receptors located approximately 600 feet southwest of the project site near the intersection of Cyclotron Road and Hearst Avenue. Although these predicted noise levels would slightly exceed the City of Berkeley's maximum allowable receiving noise standard of 60 to 65 dBA (depending on the residential zone where noise is heard) for stationary equipment (i.e., construction equipment that is operated over a period of 10 days or more), implementation of Mitigation Measure I.1 would reduce construction noise to a less-than-significant level, as described further below.

The 1987 LRDP EIR, as amended, anticipates that operations, development and construction activities at LBNL within the planning period would be likely to create noise impacts that exceed or conflict with City of Oakland and City of Berkeley noise ordinances. Where exceedances are expected to occur from construction activities — site work and exterior construction — of temporary duration (approximately one to two years), the analysis found that such impacts would be expected to be less than significant (Impact III-K-3). Field testing confirmed that the nearest residences would not be subject to significant levels of noise during construction. The 1987 LRDP EIR, as amended, requires that construction be scheduled to avoid compounding construction activities. According to the 1987 LRDP EIR, as amended, LBNL construction contracts will limit construction to daytime activities.

[32] The 6 dBA attenuation with every doubling of distance assumes only geometric spreading of the sound waves and does not take into account other factors such as topography, atmospheric absorption and reflection, etc. In fact at the Building 49 site, topography plays an important role in attenuating noise as there is no line of sight between the project site and nearest sensitive receptors. Noise testing was conducted by ESA at the site to determine the site specific attenuation factor. Simultaneous noise measurements were taken 50 feet from a noise source and at the nearest residential receptor along Highland Place. The attenuation factor was calculated from those measurements to be approximately 11 dBA per doubling of distance from the source. However, since the measurements could be influenced by variation in topography and by buildings and other structures that sometimes attenuate noise, the measured attenuation is valid only for the Highland Place location. The published value of 6 dBA per doubling of distance is a widely accepted standard and would make the analysis more conservative. Therefore, an attenuation rate of 6 dBA was used in the evaluation of significance of project impacts.

TABLE IV.I-2
TYPICAL COMMERCIAL CONSTRUCTION NOISE LEVELS, dBA

Phase	Noise Level (L_{eq})[a]
Ground Clearing	84
Excavation	89
Foundations	78
Erection	85
Exterior Finishing	89

[a] Estimates correspond to a distance of 50 feet from the noisiest piece of equipment associated with a given phase and 200 feet from the other equipment associated with that phase.

SOURCE: U.S. Environmental Protection Agency, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances, December 1971.

LBNL buildings adjacent to the project site would also experience temporary noise impacts during construction. The 1987 LRDP EIR, as amended recognizes this impact (Impact III-K-2) and compliance with Mitigation Measure III-K-2, as part of the project would reduce this impact to a less than significant level.

Truck traffic associated with hauling of excavated material off the LBNL site would result in increased noise along the haul route for the approximately three-month excavation period. However, on an hourly basis, the increase would be no more than 1-2 dBA along Hearst Avenue, and the increase would be less along Shattuck and University Avenues, where traffic volumes are higher. Although noise from individual trucks could be apparent, the change in average hourly noise levels would not be perceptible.

Construction noise would not result in a substantial increase in ambient noise levels, because most construction noise would be intermittent. However, construction noise would be perceptible at the nearest sensitive receptors, where the average noise levels were found to range from 48 to 57 Leq.

Mitigation Measure I.1: To reduce daytime noise impacts due to construction, LBNL shall require construction contractors to implement noise reduction measures.

These measures expand upon Mitigation Measures III-K-1 and III-K-2 from the 1987 LRDP EIR, as amended:

- Construction activities would be limited to the hours of 7:00 a.m. to 7:00 p.m. on weekdays, and the hours of 8:00 a.m. to 4:00 p.m. on Saturdays. No construction shall occur on Sundays or holidays. Soil off-hauling would be restricted to between the hours of

9:00 a.m. and 4:00 p.m. This would eliminate any noise impacts during the more noise-sensitive nighttime hours and on days when construction noise might be more disturbing.

- Equipment and trucks used for project construction shall utilize the best available noise control techniques (*e.g.,* improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically-attenuating shields or shrouds, wherever feasible).

- Impact tools (*e.g.*, jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible.

- Noise from idling trucks shall be kept to a minimum. No trucks shall be permitted to idle for more than 10 minutes if waiting within 100 feet of a residential area.

- Stationary noise sources shall be located as far from adjacent receptors as possible, and they shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or other measures to the extent feasible.

- At least two weeks prior to the start of excavation, LBNL or its contractor shall provide written notification to all neighbors within 500 feet of the project site, including residents along Highland Place. The notification shall indicate the estimated duration and completion date of the construction, construction hours, and necessary contact information for potential complaints about construction noise (i.e., name, telephone number, and address of party responsible for construction). The notice shall indicate that noise complaints resulting from construction can be directed to the contact person identified in the notice. The name and phone number of the contact person also shall be posted outside the LBNL boundaries (e.g., at the Blackberry Canyon Gate).

Significance after Mitigation: Less than Significant.

OPERATIONAL IMPACTS

Impact I.2: Project operational noise such as mechanical equipment noise would not result in a substantial permanent increase in ambient noise levels at sensitive receptors. (Less than Significant)

Once operational, the project would not result in an increase in motor vehicle trips. This is because Building 49 would accommodate existing employees at the LBNL site and would not lead to an increase in the number of employees or visitors to the lab. Therefore, the proposed project would not increase noise from traffic on the local; roadway network. The project would, however, introduce stationary sources of noise such as Heating, Ventilation and Air Conditioning (HVAC) equipment at the new building. HVAC equipment involves fans and compressors that are designed by the manufacturer to operate quietly and unobtrusively. Since LBNL will install

and operate the HVAC equipment in compliance with manufacturer's standards, the noise impact to nearby residents and adjacent land uses would be less than significant. Also, given that the nearest off-site sensitive receptors are almost 600 feet away, HVAC system noise would not be measurable off-site.

Other than HVAC equipment at the proposed building, the project would not introduce any new noise sources. Therefore, the impact of project operation would be less than significant on the ambient noise environment.

In addition, the project would implement Mitigation Measure III-K-1 from the 1987 LRDP EIR, as amended, as part of the project, thereby ensuring that long-term noise impacts are less than significant.

Mitigation: None required.

CUMULATIVE IMPACTS

Impact I.3: The project together with anticipated future development at LBNL and in the surrounding area could result in a cumulative increase in noise levels. (Less than Significant)

The project's long-term contribution to the ambient noise environment at and around the site would be so minimal that it would not be distinguishable from other existing and future noise sources. Most development on the UC Berkeley campus, in the City of Berkeley, and even in other parts of LBNL—including the Molecular Foundry—would be too far and not of sufficient noise energy to contribute to the same ambient noise to the same receptors. Therefore, the project's contribution to any significant cumulative impact from development in the surrounding area, including projects identified in this EIR at LBNL, the City of Berkeley, and the UC Berkeley campus, area would be considered less than significant.

Mitigation: None required.

SUMMARY OF IMPACTS AND MITIGATION MEASURES

As noted in the discussion above, under the 1987 LRDP EIR, as amended, with the incorporation of the proposed Mitigation Measures, the proposed project would not exceed the Standards of Significance established for environmental effects related to noise.

The proposed project would incorporate 1987 LRDP EIR, as amended, Mitigation Measures III-K-1 and III-K-2.

Potentially significant impacts not mitigated by 1987 LRDP EIR, as amended, mitigation measures: Building 49 project-specific Mitigation Measure I.1 has been added to fully mitigate potential noise impacts resulting from project construction. As a result, no significant temporary or permanent noise impacts would result from the proposed project.

Building 49 Project-Specific Mitigation Measures: See Mitigation Measure I.1 presented above.

J. PUBLIC SERVICES

INTRODUCTION

As more fully described in the 1987 LRDP EIR, as amended, potential adverse impacts on public services could result from the University's continued operation of LBNL, including the increased population at LBNL that is projected to occur due to continued implementation of the 1987 LRDP EIR, as amended.

The Initial Study Checklist (see Appendix A) for the proposed project found potential impacts to schools, recreational facilities, and other government facilities to be less than significant. Therefore, those issues are not discussed below.

SETTING

FIRE SUPPRESSION

LBNL maintains its on-site fire protection services through contract with Alameda County. Fire protection services include an on-site fire department that is staffed 24 hours per day by shifts of at least four firefighters. LBNL's on-site fire department staff are trained as Emergency Medical Technicians. In addition, there are two trained paramedics on the fire staff. There is one fire engine, one reserve fire engine, a hazardous materials vehicle, and a light duty four-wheel drive "brush rig" that can be used for wildland fires at the LBNL fire department. The fire apparatus is located in the center of the LBNL site. The Berkeley Fire Department provides paramedic transport and emergency medical service to LBNL.

LBNL also has an automatic aid agreement with the City of Berkeley and mutual aid agreements with other communities to assist in firefighting. LBNL maintains its own emergency number as well as "911" service. LBNL's internal emergency number rolls over to the County emergency services dispatcher.

POLICE PROTECTION

LBNL contracts with a private security provider for its on-site security needs, as well as with the UC Berkeley Police Department (UCPD), which includes 77 police officers, 45 full-time non-sworn personnel, and 60 student employees. UCPD, located at 1 Sproul Hall, has primary law enforcement jurisdiction on the campus of the University of California and associated University properties, including LBNL. UCPD is organized into four divisions, which include Administration; Community Outreach and Emergency Services; Investigative and Support Services; and Patrol. The department is empowered as a full-service state law enforcement agency pursuant to section 830.2 (b) of the California Penal Code and fully subscribes to the standards of the California Commission on Peace Officer Standards and Training (POST). Officers receive the same basic training as city and county peace officers throughout the state, plus additional training to meet the unique needs of a campus environment.

On-site security staff at LBNL totals approximately 25 personnel, which are divided into five to six personnel per shift. UC Berkeley Police respond to LBNL as needed under the existing contract. LBNL security can respond to any accessible area of LBNL within five minutes. UC Berkeley Police response time is between five and ten minutes. LBNL's "Cleary Act" statistics for homicide, rape, assault, and robbery are zero for each category.

REGULATORY ENVIRONMENT

Development programs have been identified in the 1987 LRDP to accommodate growth at LBNL. One of the principal programs is directed toward fire safety coordination. The fire safety measures "include participation in preventive burn programs and control of vegetation on LB[N]L land and the development of a plan for planting fire-resistant species."

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The impact of LBNL projects on public services would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the state CEQA *Guidelines* and the UC CEQA Handbook:

- Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response time or other performance objectives for any of the following public services:
  - Fire protection
  - Police protection; or
  - Exceed an applicable LRDP or Program EIR standard of significance.

The following impacts to public services have been anticipated and analyzed pursuant to CEQA, as part of the programmatic 1987 LRDP EIR, as amended, from which this analysis is tiered:

Impact III-L-1:	The construction of additional facilities and any increased population would not cause increased impacts on local police and fire protection services.
Cumulative Impacts:	No significant cumulative impacts to public services at and in the vicinity of LBNL are anticipated.

The 1987 LRDP EIR, as amended, does not contain public service mitigation measures that would be applicable to the proposed project. All potential impacts were found to be less than significant.

EXCAVATION, GRADING, AND CONSTRUCTION IMPACTS

Impact J.1: Project construction would result in a temporary impact to fire and police response times. (Less than Significant)

The construction phase of the project would not significantly affect response times to the project site and its vicinity as a result of any potential temporary construction-related roadway lane closures and detours. No complete road closures are anticipated during the construction period. Construction activities would be overseen so as to comply with applicable safety requirements, including LBNL-specific requirements and those of the U.S. Department of Energy, the federal Occupational Safety and Health Administration, and the California Occupational Safety and Health Administration, as appropriate and applicable at the time of construction. All appropriate fire, emergency medical, and police services would be consulted and informed of every appropriate aspect of project design and construction.

Mitigation: None required.

OPERATIONS IMPACTS

Impact J.2: Project operation would result in a marginal increase in demand for police and fire protection services. (Less than Significant)

The proposed project is within an area already served by adequate fire and police protection services. Increased demands for police and fire protection services are usually associated with increases in population and employment, which may also lead to a need for new facilities. The proposed project would not introduce any additional population or employment positions into the area. Rather, the proposed project would reduce overcrowding in other LBNL buildings by relocating them to the proposed Building 49. Therefore, the proposed project would not result in any substantive impacts to the provision of police or fire protection services as a result of the operations of the proposed project.

The proposed project would not exceed a Standard of Significance established by the programmatic 1987 LRDP EIR, as amended. Public Services impacts would be less than significant with the incorporation of 1987 LRDP EIR, as amended, Mitigation Measure III-L-1. No project-specific mitigation measures would be required.

Mitigation: None required.

CUMULATIVE IMPACTS

Impact J.3: The proposed project, together with anticipated future development at LBNL and in the surrounding area, could result in a cumulative increase in demand for police and fire protection services. (Less than Significant)

LBNL maintains its own primary public services (fire protection, security, health and safety); the proposed project would decompress existing on-site employees and would thus not substantially add to demand for services; the Molecular Foundry would marginally increase public services demand but well within levels anticipated and accommodated in the existing LRDP and 1987 LRDP EIR, as amended. Although City of Berkeley and UC Berkeley campus projects would be expected to gradually increase demand for off-site services over time, proposed project-related demand for off-site services would be negligible and cumulative impacts would be less than significant.

SUMMARY OF IMPACTS AND MITIGATION MEASURES

As noted in the discussion above, under the 1987 LRDP EIR, as amended, the proposed project would not exceed the Standards of Significance established for environmental effects related to public services.

Potentially significant impacts not mitigated by 1987 LRDP EIR, as amended, mitigation measures: None. No significant impacts to the provision of public services would result from the proposed project.

Building 49 Project-Specific Mitigation Measures: None required.

K. TRANSPORTATION/TRAFFIC

INTRODUCTION

As more fully described in the 1987 LRDP EIR, as amended, potential impacts on transportation/traffic conditions could result from continued University operation of LBNL, including continued facility development as contemplated in the 1987 LRDP.

This section discusses existing transportation/traffic conditions in the project area and analyzes the potential for the project to affect those conditions, focusing on traffic flow on roadways serving the project site, as well as provisions for parking at LBNL.

SETTING

ROADWAY NETWORK

The primary access routes to LBNL are Grizzly Peak Boulevard – Centennial Drive, University Avenue, Hearst Avenue and Piedmont Avenue – Gayley Road. Access to the site is provided by three sentry-controlled gates: Blackberry Canyon (main gate), Strawberry Canyon, and Grizzly Peak. In 1998 approximately 9,100 vehicles passed through these three gates (access and egress) on a typical work day – about 930 and 820 vehicles during the a.m. and p.m. peak hours, respectively.

SHUTTLE BUS SERVICE

LBNL operates a free shuttle bus service within the LBNL site, and between LBNL and the UC Berkeley campus and downtown Berkeley (connecting with the Berkeley BART Station and AC Transit bus lines). Another off-site shuttle provides express service to and from the Rockridge BART Station at select commute hours. The principal off-site shuttle operates from 6:30 a.m. to 6:50 p.m., running every ten minutes up until 5:50 p.m., when shuttles run at 20-minute intervals. There is a shuttle bus stop less than 500 feet from the planned East Road entrance to Building 49, and another at the Blackberry Gate, in front of the Building 49 site.

TRAFFIC OPERATING CONDITIONS

Existing traffic level of service (LOS) conditions were assessed at the following five key (gateway) intersections for weekday a.m. and p.m. peak traffic hours:

- University Avenue and Shattuck Avenue (southbound) – signalized
- Hearst Avenue and La Loma Avenue / Gayley Road – signalized
- Gayley Road and Stadium Rim Way – all-way stop-sign control
- Piedmont Avenue and Dwight Way – signalized
- Grizzly Peak Road and Centennial Drive – all-way stop-sign control

The LOS concept is a qualitative characterization of traffic conditions associated with varying levels of traffic, based on delay and congestion. Descriptions of conditions range from LOS A (free-flow condition) to LOS F (jammed condition). LOS C or better are generally considered to be satisfactory service levels, while LOS D is minimally acceptable, LOS E is undesirable, and LOS F conditions are unacceptable.

Traffic counts were conducted at each of the study intersections when UC Berkeley was in session.[33] The five study intersections currently operate at LOS B during a.m. and p.m. peak hours, except the all-way stop-sign-controlled intersection of Gayley Road / Stadium Rim Way, which operates at LOS F during both peak hours.

PARKING

The supply of parking spaces at LBNL is limited, and its use is controlled by a permit system (strictly enforced) that allocates available parking spaces to different types of employees and visitors. LBNL maintains over 2,200 parking spaces sitewide, which are posted for different permit types and uses. The main categories of permit types include "Orange Circle" spaces are for Laboratory Directors, "Blue Triangle" spaces for Senior Researchers and supervisors, "General" spaces for regular employees, as well as special permits for car pools, motorcycles, handicapped or disabled drivers, and after-hours workers. Graduate students are not granted parking privileges.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The impact of LBNL projects on transportation and traffic would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the state CEQA *Guidelines* and the UC CEQA Handbook:

- Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e. result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections);
- Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways;
- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;
- Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment);
- Result in inadequate emergency access;

[33] Peak-period traffic counts were conducted at the study intersections in November 2000, February 2002, and March 2002 by Wilbur Smith Associates for the LBNL LRDP EIR analysis.

- Result in inadequate parking capacity;
- Conflict with applicable policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks);
- Exceed an applicable LRDP or Program EIR standard of significance;
- Cause levels of service at an intersection to degrade below LOS D; or
- Cause significant incremental decline in service at an intersection currently operating at LOS E or worse.

The following relevant impacts to transportation and traffic have been anticipated and analyzed pursuant to CEQA, as part of the programmatic 1987 LRDP EIR, as amended, from which this analysis is tiered:

Impact III-I-1:	Incremental increases in traffic are expected due to projected increases in the number of employees and visitors at LBNL.
Impact III-I-2:	The ratio of parking spaces to LBNL employees will decrease during the LRDP implementation period.
Cumulative Impacts:	Cumulative population growth and facility development in the vicinity of LBNL has resulted in a deterioration of levels of service at intersections on feeder routes into the UC Berkeley campus and LBNL area.

As a result of anticipated impacts to transportation and traffic, the following mitigation measures, adopted as part of the 1987 LRDP EIR, as amended, are already required for the proposed project, and are therefore incorporated as part of the proposed project's description:

Mitigation Measure III-I-1a: Discourage single occupant vehicle use and encourage the use of other transportation options. LBNL will continue to implement its Transportation System Management (TSM) Program. The specific features of this program include:

Establishing transportation modal-split goals for LBNL which will result in a reduction in the number and percentage of single-occupant automobiles being driven to and from LBNL;

Assigning a transportation planner to coordinate the design and implementation of TSM programs;

Promoting carpools by creating a carpool matching program;

Providing preferential carpool parking;

Developing a vanpooling program through funding support of Berkeley TRIPS;

Permitting staggered (flex-time) work hours;

Developing an annual monitoring program to evaluate the programs in relation to established goals and identify new elements which should be added to the program;

Promoting the TSM programs by giving orientation briefings to new employees, providing information aids to be distributed to LBNL employees, organizing an information center, and selling transit tickets on-site at LNBL;

Reviewing LBNL shuttle service and transit interface facilities; and

Reviewing bicycle routes and storage facilities for improvements.

Mitigation Measure III-I-1b: LBNL will conduct bi-annual peak hour traffic counts in and around LBNL. In particular, the bi-annual count will include the Gayley Road corridor between Hearst Avenue and Bancroft/Piedmont.

Mitigation Measure III-I-1c: If and at such time as the level of service at intersections along the Gayley Road corridor reaches "D," a review of necessary improvements will be conducted with UC Berkeley;

Mitigation Measure III-I-1d: LBNL will pay for its fair share of allowable and necessary signalization improvements along the Gayley Road corridor proportional to LBNL's share of increases in traffic.

Mitigation Measure III-I-1e: Details of the Gayley Road corridor improvements, including environmental assessment of the improvements, will be reviewed at the time the thresholds are reached.

Mitigation Measure III-I-2: LBNL will continue to implement and monitor the implementation of its Transportation System Management Program.

Cumulative Impacts: The cumulative measures undertaken by the City of Berkeley, UC Berkeley and LBNL should result in a net improvement in the traffic and parking conditions in the immediate vicinity of LBNL and UC Berkeley.

EXCAVATION, GRADING, AND CONSTRUCTION IMPACTS

Impact K.1: Construction of the proposed project, including all earthmoving activities such as excavation and grading, would result in a temporary increase in traffic volumes on roadways used by construction-related vehicles. (Less than Significant)

Project construction between spring 2004 and fall 2005 would result in temporary and intermittent increases in traffic volumes on area roadways. Those increases would be associated with commute trips by construction workers and the movement of equipment used for excavation and construction of the proposed building.

The approximately 26,000 cubic yards of excavated soils would be hauled to an off-site landfill via Cyclotron Road (Blackberry Canyon Entrance), Hearst Avenue and University Avenue, to Interstate 80. The destination(s) of the material (i.e., Hayward or Martinez, or both) would dictate in which direction trucks would then travel on I-80. On the basis of the an average haul truck capacity of 12 cubic yards per truck, there would be about 2,170 total truck loads (i.e., about 4,340 one-way truck trips) spread over the three-month period when site excavation occurred. Because those truck trips would be made during the seven-hour period between 9:00 a.m. and 4:00 p.m. (to avoid the commute traffic hours), 33 trucks per day would generate 66 daily one-way trips, with average of nine one-way trips per hour (i.e., one truck every 6.5 minutes).

Construction-generated traffic would be temporary and therefore would not result in long-term degradation in operating conditions on project roadways. The estimated increase in traffic volumes caused by project-generated haul truck traffic on the above-described haul route would not be substantial, and would not significantly disrupt daily traffic flow on these roadways. The primary impacts from construction truck traffic would include a temporary and intermittent reduction of roadway capacities due to the slower movements compared to passenger vehicles. However, the estimated number of construction-generated vehicle trips (i.e., a maximum of one truck every 6.5 minutes between 9:00 a.m. and 4:00 p.m.) would not cause significant traffic delays. Because construction truck traffic would occur outside the peak commute hours, there would be no effect on peak-hour intersection levels of service. Furthermore, the number of construction trucks would be too small to result in any adverse change in off-peak levels of service.

If project truck traffic were to occur during the hours of 7:00 to 9:00 a.m. and 4:00 to 6:00 p.m., the added volume would coincide with peak-hour traffic and could impede traffic flow. The LBNL-proposed project feature of restricting truck traffic during the a.m. and p.m. peak periods would minimize disruption of the general traffic flow on affected roadways during those times.[34]

Contractors would implement standard Best Management Practices in order to mitigate any short-term construction-related transportation impacts. Generally, these practices include implementation of a traffic control plan, such as measures (e.g., advance warning signs, flaggers

[34] It is noted that truck traffic would not pass through the intersection of Gayley Road and Stadium Rim Way, which is the only study intersection currently operating at an unacceptable level of service.

to direct traffic, and advance notification of interested parties about the location, timing, and duration of construction activity) to maintain safe and efficient traffic flow during the construction period. The effect on traffic conditions would be less than significant.

Mitigation: None required.

OPERATIONS IMPACTS

Impact K.2: The project would not adversely affect traffic patterns in the project area. (Less than Significant)

The proposed project would generate few, if any, new vehicle trips. The basis for that determination was that the planned use of the proposed Building 49 is to relieve current overcrowded conditions in LBNL office space. The proposed building would neither increase nor decrease the employment level of the LBNL site. The ten new parking spaces provided at the Building 49 site would be used for handicapped parking, visitor parking, short-term deliveries, and/or fleet parking, but not for general staff parking.

At this time, it is estimated that approximately 70 percent of the up to 240 employees in Building 49 would come from the Building 50 complex, and the other 30 percent would come from the Building 70 complex; both complexes are in close proximity to the project site. Therefore, it is expected that the to-be-relocated employees who now drive to their current work locations would continue to drive similar commute routes to LBNL, and any change to travel patterns would be minimal. Thus, levels of service at all study intersections would remain the same as or similar to existing conditions. The proposed project therefore would have a less-than-significant impact on traffic conditions on the area roadway system.

Mitigation: None required.

Impact K.3: The project would not affect parking in the project area. (Less than Significant)

LBNL offers parking privileges to full-time employees and visitors, but not to graduate students, who are otherwise present on the UC Berkeley campus and have access to LBNL's free shuttle system. Given that the up to 240 employees in the building already work at the LBNL site and would not be replaced, there would be no increase in demand for staff parking. The proposed project would provide ten new parking spaces at Building 49 (five each at the entry plazas on Cyclotron Road and East Road), which would be used for handicapped parking, visitor parking, short-term deliveries, and/or fleet parking. Therefore, the proposed project would have no impact on parking conditions after project occupancy.

Mitigation: None required.

Impact K.4: The project would not adversely affect transit service in the project area. (Less than Significant)

The LBNL free shuttle bus system provides frequent service between downtown Berkeley (which is well-served by public transportation, including services provided by BART and AC Transit) and the LBNL site, as well as service within the LBNL site between Lab buildings, with a shuttle bus stop immediately north of the Building 49 site and another at the Blackberry Gate, almost directly in front of the Building 49 site. Another off-site shuttle provides express service to and from the Rockridge BART Station at select commute hours. As described under Impact K.2, above, the proposed building would have no effect on the employment level of the LBNL site. The project would not conflict with adopted policies, plans, or programs supporting alternative transportation.

Mitigation: None required.

Impact K.5: The project would introduce added people and turning vehicles in the immediate project areas, potentially affecting access and safety. (Less than Significant)

The project would neither alter the physical configuration of the existing roadway network serving the area, nor introduce unsafe design features or incompatible uses into the area. The physical and traffic characteristics of area roadways (e.g., traffic signal and stop-sign control, pedestrian crosswalks and crossing signals, and bicycle lanes) would safely accommodate project-generated traffic (both vehicular and non-motorized). The project's effect on safety would be less than significant.

The project would not alter the physical configuration of the existing roadway network serving the proposed Building 49. Access to the building would be provided from Cyclotron Road and East Road (the building would be accessible from Cyclotron Road at the ground floor level, and from East Road at the uppermost story). There would be less-than-significant impacts associated with project general and emergency access.

Mitigation: None required.

CUMULATIVE IMPACTS

Impact K.6: The proposed project, when combined with other proposed on-site Lab development, including the Molecular Foundry, could affect traffic patterns in the project area. (Less than Significant)

As described above under Impact K.2, the proposed project would generate no new operational vehicle trips, and would have a less-than-significant effect on traffic conditions. The recently approved Molecular Foundry building would have a similar (less-than-significant) project-specific result. Under cumulative (2020) conditions, traffic volumes would increase on area roadways and at study intersections, due to development foreseen by LBNL under its revised LRDP, and by the cities of Berkeley and Oakland, and by UC Berkeley. Recent (2001) estimates of increases in roadway and intersection traffic volumes were presented in the University of California at Berkeley's *Northeast Quadrant Science and Safety (NEQSS) Projects* EIR and the City of Berkeley's *General Plan Update EIR*. The study intersections would continue to operate at acceptable levels of service (LOS D or better) during the a.m. and p.m. peak hours, except at the Gayley Road / Stadium Rim Way intersection, where delays within LOS F would increase. The proposed project would not add traffic to those long-term cumulative conditions. Construction traffic would be short-term and incremental, and would not cumulatively coincide with most of the major construction projects identified in this EIR. The proposed project therefore would have a less than significant impact on traffic conditions on the area roadway system.

Mitigation: None required.

SUMMARY OF IMPACTS AND MITIGATION MEASURES

As noted in the discussion above, under the 1987 LRDP EIR, as amended, the proposed project would not exceed the Standards of Significance established for environmental effects related to transportation and traffic.

Potentially significant impacts not mitigated by 1987 LRDP EIR, as amended, mitigation measures: None. No significant transportation or traffic impacts would result from the proposed project.

Building 49 Project-Specific Mitigation Measures: None required.

L. UTILITIES, SERVICE SYSTEMS, AND ENERGY

INTRODUCTION

As more fully described in the 1987 LRDP EIR, as amended, potential impacts on utilities and waste services could result from continued University operation of LBNL, including continued facility development as contemplated in the 1987 LRDP.

SETTING

WATER SUPPLY

The LBNL facility receives its water from the East Bay Municipal Utility District (EBMUD) at two separate connections. The proposed project would be served by EBMUD's Shasta Pressure Zone (PZ), which provides water service to customers within an elevation range of 900 to 1,050 feet and has a 2 million gallon capacity, and the Berkeley View PZ, which provides water service to customers within an elevation range of 1,050 to 1,250 feet and has a 1 million gallon capacity. The LBNL site receives its water supply via a 12-inch meter in Campus Drive in the Shasta PZ and via a 6-inch meter in Summit Road from the Berkeley View PZ. Both of the EBMUD facilities are part of the EBMUD system and are backed by many additional reservoirs, pumping facilities, aqueducts, and transmission lines. The EBMUD system has been reliable over the years and has been properly maintained, monitored, and operated.

The LBNL system which distributes the EBMUD water within the site consists of an extensive piping layout providing domestic water and fire protection water to all LBNL installations. The LBNL system also supplies make-up water for cooling towers, irrigation water, and water for other miscellaneous uses. The system includes fire hydrants and fire department connections and sprinkler services to almost all buildings.

The LBNL system is looped in many areas and is equipped with block valves which can be used to isolate portions of the pipe for repair or replacement while still maintaining full service to most facilities.

Because of the differences in elevation at LBNL, there are two main pressure zones which operate at the nominal pressure of 70 psi.[35] The system is entirely a gravity system, except for the emergency fire protection system. Most of the existing pipe is either cement lined and coated steel pipe with welded joints or cast iron and/or ductile iron pressure pipe with mechanical joints. Much of the pipe has been designed and installed to resist forces caused by earth movement due to slides and/or earthquakes. All of the newer lines have been located to avoid potential unstable earth areas.

[35] Pounds per square inch: the amount of operating pressure.

In addition, the Department of Energy (DOE) owns and maintains two 200,000-gallon storage tanks on-site, one of which is located near Building 75 and the other of which is located near Building 71, for emergency supply in the event of interruption of EBMUD's service. At each 200,000-gallon tank site there is a diesel-driven fire pump with automatic controls that can pressurize the LBNL system if EBMUD services are interrupted. In normal operation, water is slowly circulated from the LBNL system through the 200,000-gallon tanks so they are always filled with potable water and the full 400,000 gallons are always available if required. These emergency fire water systems were installed around 1979. A third 200,000-gallon emergency tank is under construction in the East Canyon area.

The water system at LBNL has a high degree of reliability for both domestic use and emergency purposes. This reliability exists by virtue of the two separate connections to EBMUD sources, the two 200,000-gallon storage tanks, and the high quality of both the LBNL and EBMUD systems.

WASTEWATER

Wastewater from LBNL is carried via a gravity flow system through two monitoring stations, one located at Hearst Avenue and the other at Centennial Drive in Strawberry Canyon. The project would be served by the Hearst Avenue Station. It connects to the City of Berkeley's public sewer system and then to an EBMUD-operated intercepting sewer, which transports effluent to a regional wastewater treatment plant located southwest of the interchange of I-80 and I-580 in Oakland. The facility is owned by EBMUD and serves six East Bay cities and the Stege Sanitary District.

The main concern with sewer flow in this subbasin and region-wide in the EBMUD system is the infiltration and inflow (known as "infiltration / inflow") of stormwater into the sanitary sewer system due to the poor condition of aging sewer pipes. LBNL has aggressively acted to address infiltration / inflow problems in its own system and has made dramatic improvements in recent years. In addition, an aggressive plumbing maintenance and upgrade effort has been undertaken during the past 15 years by LBNL, along with installation of water saving devices and systems, to substantially lower average sewer flows as well. The savings realized by these on-going efforts has reduced both peak wet weather as well as average sewer flows by well over half. Moreover, LBNL's peak wet weather infiltration / inflow rate is less than half of that of the City of Berkeley's and it is only approximately ten percent of that found in EBMUD's district on average. LBNL continues to seek ways in which to reduce both water consumption and sewage generation. While sewer flows vary widely according to the time of day and time of year, LBNL's approximate average daily flow at the Hearst monitoring station is about 75,000 gallons per day (gpd) and can range from 30,000 to 100,000 gpd. Through the University of California, LBNL currently pays the City of Berkeley for assessed sewer services. In addition, the University has contributed to the City of Berkeley's sewer upgrade program. This program is intended to increase wet weather flow capacity and decrease infiltration / inflow conditions.

STORM DRAINAGE

Because of LBNL's hillside location, a storm-drainage system has been installed that discharges into the north fork of Strawberry Creek to the north and Strawberry Creek to the south. The existing system provides for runoff intensities expected in a 25-year maximum-intensity storm.

SOLID WASTE

The LBNL Waste Management Group, within the Environment, Health and Safety Division, provides a range of waste management services to LBNL staff and visitors. As a government-owned facility operated through contract by the University of California, LBNL must comply with waste minimization reporting requirements issued by the U.S. Department of Energy (DOE), the State of California, the University of California, and by LBNL itself. Appendix F of the contract between the University of California and the DOE for the operation of LBNL contains a Performance Measure pertaining to sanitary waste reduction. The goal, consistent with the overall DOE Performance Measure, is to reduce the amount of routine solid sanitary waste going to land disposal by 67 percent by the end of Fiscal Year (FY) 2004, using the amount of solid sanitary waste sent to land disposal in 1993 as the baseline. LBNL has achieved solid sanitary waste reduction of 62.8 percent, and is expected to meet the FY 2004 goals. The reductions were achieved through waste segregation and recycling efforts and through a composting and mulching program.[36] The plant material recycling program has resulted in a 10 percent reduction in LBNL solid waste.

UC Berkeley collects non-hazardous solid waste generated at LBNL and takes it to a private recycling facility in Oakland where recycled materials are sorted and the remaining non-recyclable solid waste is baled and sent to a landfill. Construction and grounds waste are hauled by Oakland Scavenger Company under contract to UC Berkeley. These non-recyclable materials are taken to the Altamont Landfill in Livermore.

ELECTRICITY

Electrical power to LBNL is provided by the LBNL Grizzly substation located adjacent to Building 77. PG&E delivers this power to LBNL on two overhead 120 KV transmission lines with a joint capacity of approximately 100 MVA. Both these transmission lines feed power from PG&E's El Sobrante switching station to the Grizzly substation. The Grizzly substation consists of two PG&E owned 120/12 KV power transformers with a combined capacity of 50 MVA. This substation is for the exclusive use of LBNL, with the exception of three 12 KV feeders which transmit power to the UC Berkeley campus through an underground right-of-way. In addition, LBNL can be supplied from PG&E's Berkeley substation. This is an emergency line that can supply five megawatts, which must be shared with UC Berkeley.

[36] Data are compiled from waste and recycling quantities reported by LBNL's sanitary waste contractors. Routine solid sanitary waste does not include wastes generated during site renovations, site restoration, or other one-time activities, or recycled waste.

The main power distribution system within LBNL property consists of a 12 KV underground system with smaller substations and transformers which reduce voltage to 480/277 V or 208/120 V. The 12 KV distribution system has dual primary feeders to provide reliable power. Certain buildings are equipped with special voltage regulation in order to ensure that critical experiments will not be disrupted by transient voltage within the system. LBNL schedules its bigger loads so that the peak demand is kept to a minimum.

NATURAL GAS

The existing LBNL natural gas system receives its supply from a six-inch PG&E line operating at 50 psi. The point of delivery is a meter vault in the hillside area above Cyclotron Road and below Building 88. The natural gas system piping consists of bare steel pipe, coated and wrapped steel pipe, and a portion of copper pipe; newer pipe in the system in is polyethylene. The system includes pipes, valves, fittings, pressure reducing stations, earthquake emergency shut-off valves, meters, and appurtenances.

REGULATORY ENVIRONMENT

1987 LBNL LRDP

The following planning objective in the 1987 LBNL LRDP is relevant to the proposed project:

- Promote energy conservation and cost economies through efficient design, location, operation, and maintenance.

Applicable design guidelines in the 1987 LBNL LRDP include the following:

- *Utilities Corridors*: Utility distribution systems are, where feasible, to be placed in trenches and under roadways. Central and localized distribution stations and feeder lines are located and sized for future building locations and anticipated demand and will be subject to design reviews for compatibility with general site developments and future site needs.

- *Energy and Operational Efficiency*: Buildings are to employ optimum energy strategies and efficiency features to include building orientation, natural illumination and sun control, and automated ventilation and climate-control systems, where feasible.

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The project is located adjacent to an urban area and all basic utilities are adjacent to the project site. It is not anticipated that additional needs created by the project would be sufficient to necessitate construction of new or expanded systems. See section IV.G., *Hydrology and Water Quality* for information regarding storm water drainage.

The impact of LBNL projects on utilities, service systems, and energy would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the state CEQA *Guidelines* and the UC CEQA Handbook:

- Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board;
- Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
- Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
- Have insufficient water supplies available to serve the project from existing entitlements and resources, or if new or expanded entitlements are needed;
- Result in a determination by the wastewater treatment provider which serves or may serve the project that it does not have adequate capacity to serve the project's projected demand in addition to the provider's existing commitments;
- Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs;
- Would not comply with applicable federal, state, and local statutes and regulations related to solid waste;
- Exceed the capacity of an Energy supplier to provide the project's energy needs; and,
- Exceed an applicable LRDP or Program EIR standard of significance.

The following relevant impacts to utilities, service systems, and energy have been anticipated and analyzed pursuant to CEQA, as part of the programmatic 1987 LRDP EIR, as amended, from which this analysis is tiered:

Impact III-M-1:	Projected development according to the 1987 LRDP may create demands with regard to existing waste water and sanitary sewer systems.
Impact III-M-2:	Development proposed under the 1987 LBNL LRDP would increase the demand for domestic water. This demand is well within the capacity of the existing ties to EBMUD and the LBNL water distribution system. This demand is not considered significant.
Impact III-M-3:	Development proposed under the 1987 LBNL LRDP would increase the usage of natural gas. The projected usage is within the capacity of the existing PG&E and LBNL systems, except for the main extensions required for new buildings. This increased usage is not considered significant.

Impact III-M-5: Development proposed under the 1987 LBNL LRDP would increase the usage of electrical power. PG&E has the capacity to supply this power. This increased usage is not considered significant.

Additional mitigation measures related to hazardous waste are discussed in Section IV.F, *Hazards and Hazardous Materials*.

As a result of anticipated impacts to utilities and service systems, the following mitigation measures, adopted as part of the 1987 LRDP EIR, as amended, are already required for the proposed project, and are therefore incorporated as part of the proposed project's description:

Mitigation Measure III-M-1: Prior to construction of any project which may add significant sewer load to the city sanitary sewer system, LBNL will investigate the potential impact of the project on the city system. LBNL will identify mitigation measures to accommodate the sewer load if the impact investigation indicates that the city system could not accommodate the additional sewage. LBNL will reimburse the City of Berkeley and/or EBMUD for its fair share of allowable and necessary sewer improvement capital costs which are needed to accommodate increased demand and mitigate sewer impacts resulting from implementation of the LBNL LRDP.

EXCAVATION, GRADING, AND CONSTRUCTION IMPACTS

Impact L.1: Project construction would generate construction waste and debris. (Significant)

Project construction would generate construction waste and debris. Waste generated by construction-related debris is estimated at approximately 2.5 pounds per square foot of construction.[37] Using that estimate, construction of the approximately 65,000 square-foot project would generate about 82 tons of debris. The construction debris would be removed from the site and disposed of at a local landfill. However, without planning for the recycling of construction waste, the Altamont Landfill's capacity for solid waste could be adversely impacted. Implementation of the following mitigation measure would ensure that the project's impact to the Altamont Landfill would be less than significant.

According to the LEED scorecard prepared by OJO Associates, LLC, 50 percent of construction waste would be diverted, approximately 5 percent of resources would be reused, approximately 25 percent of building materials would be recycled, approximately 20 percent of building materials would be manufactured locally, rapidly renewable materials and certified wood would be used in the construction of the building (OJO Associates, 2002b).

[37] This estimate is taken from the Metropolitan Service District's "*Characterization of Construction Site Waste, Final Report,"* July 1993.

Additionally, assuming that the soil excavated from the Building 49 site is used as clean fill, either at a construction site or landfill, the project would reduce the need to excavate soils at the landfill(s) for elsewhere for such purpose.

Mitigation Measure L.1: During construction, LBNL shall be required to maximize diversion of the byproducts of construction. The project sponsor shall develop a plan for maximizing diversion of construction materials associated with the construction of the proposed project from landfill disposal.

Significance after Mitigation: Less than Significant.

OPERATIONS IMPACTS

Impact L.2: The project would not substantially increase the demand for water services. (Less than Significant)

The water service connection, fire and domestic, would be to the relocated eight-inch line in Cyclotron Road. Increased demands for domestic water are generally associated with increases in population and employment and increased landscaping area, which may also lead to a need for new facilities. The proposed project would not introduce any additional population or employment positions into the area. Rather, the proposed project would reduce overcrowding in other LBNL buildings by relocating them to the proposed Building 49. Additional landscaping would also be introduced to the project site. Site landscaping would include drought-tolerant plant materials with a long-term goal to wean the majority of the plant materials off the irrigation system and allow them to naturalize. In addition, as part of the final design process, irrigation would be designed so as to minimize overspray and runoff. Irrigation and landscaping are expected to be consistent with the State Water Efficient Landscape Ordinance AB 325. Any increases in demand for irrigation water caused by the proposed project would be minimal and would therefore not result in any impacts to EBMUD's provision of water services.

In addition, the project would install low-flow plumbing fixtures and water-saving appliances; other devices and new technology (e.g., drip irrigation, re-circulating cooling systems, etc.) would be considered or employed where practicable to further water conservation. All new projects are subject to the East Bay Municipal Utility District's Water Service Regulations at the time of application for service.

Therefore, the proposed project would not cause a significant impact relative to water use.

Mitigation: None required.

Impact L.3: The project would generate wastewater. (Less than Significant)

The project would be served by the Hearst Avenue Station, which connects to the City of Berkeley's public sewer system and then to an EBMUD-operated intercepting sewer, which transports effluent to a regional wastewater treatment plant in Oakland. Increased demands for wastewater service are directly related to increased demands for water. The sanitary sewer connection would be to the existing line in Cyclotron Road. As stated above, increased water demand is usually associated with increases in population and employment and increased landscaping area, which may also lead to a need for new facilities. However, the proposed project would not introduce any additional population or employment positions into the area. Rather, the proposed project would reduce overcrowding in other LBNL buildings by relocating existing employees to the proposed Building 49. Because water used for landscaping purposes is generally not discharged to the sewer system, no significant increase in wastewater generation caused by the proposed project is anticipated. Therefore, the proposed project would not result in any impacts to the City of Berkeley Department of Public Works as a result of the operations of the proposed Building 49.

The proposed building would connect to existing sewer lines. All LBNL sanitary sewage runs through the City of Berkeley's basin No. 17. According to the City of Berkeley, sewer sub-basin 17-013 is not constrained during wet weather flows (Yee, 2003). The proposed project would be directed into sub-basin 17-013; this sub-basin has more than adequate average and peak wet weather capacity to accommodate the sanitary sewage flows from the proposed project.

The proposed Building 49 is consistent with the 1987 LRDP EIR, as amended, which anticipated, analyzed, and found less-than-significant impacts for buildout levels of sanitary sewage at much higher than current levels, even with inclusion of the proposed project. Moreover, because the sewer lines installed for Building 49 would be brand new, state-of-the-art, and virtually free of stormwater infiltration, the proposed project would be incremental in both dry and wet weather and would not contribute to the problem of inflow / infiltration surplus flows during peak wet weather events.

Mitigation: None required.

Impact L.4: The project would generate solid waste. (Less than Significant)

Increases in solid waste generation are usually associated with increases in population and employment. The proposed project would not introduce any additional population or employment positions into the area. Rather, the proposed project would reduce overcrowding in other LBNL buildings by relocating existing employees to the proposed Building 49. Therefore, because there would be no net increase in employees at LBNL, there would also be no net increase in the amount of solid waste generated by the proposed project operations. In addition, Building 49 has been designed to include storage and collection of recyclable materials during project operations.

Mitigation: None required.

Impact L.5: The project would create additional demand for electricity and natural gas service. (Less than Significant)

The proposed Building 49 would be approximately 60,000 square feet and would have an estimated load requirement of approximately 712 KVA (see Table IV.L-1). This capacity is developed using generally accepted load criteria found in most university and office type environments.

TABLE IV.L-1
ANALYSIS OF POWER REQUIREMENTS FOR PROPOSED BUILDING 49

Activity	Watts/Sq. Ft. Req'd	Building Size	Total KVA
Lighting	1.2	60,000	72
HVAC	8.0	60,000	480
Receptacles	2.0	60,000	20
Miscellaneous	1.0	60,000	60
Elevators	40	2 elevators	80
Total			**712**

SOURCES: LBNL, 2003

All normal operating electrical power would be supplied by Pacific Gas and Electric Company through LBNL's existing infrastructure and the Grizzly Peak substation. In addition, LBNL can be supplied from UC Berkeley's Hillside Substation. While no new employees would be added to LBNL as a result of the proposed project, it is anticipated that the proposed project would generate an additional demand for electricity due to the daily operations of a new office building. PG&E has the capacity to supply power to the proposed project and the increased usage is not considered significant.

At LBNL, natural gas is used primarily for the heating of buildings. While no new employees would be added to LBNL as a result of the proposed project, it is anticipated that the proposed project would generate an additional demand for natural gas due to the additional heating requirements of a new office building. The PG&E and LBNL natural gas systems have the capacity to provide service to the proposed Building 49. The amount of increased usage is not considered significant.

Further, the design team for Building 49 has identified 37 points to achieve a LEED silver certification for the building (OJO Associates, 2002b).[38]

Mitigation: None required.

CUMULATIVE IMPACTS

Impact L.6: The project, in concert with other development at LBNL and in the surrounding area, would cumulatively contribute to demand for utilities. (Less than Significant)

The proposed project, the Molecular Foundry, NEQSS, and other City and UC Berkeley campus projects would be expected to increase demand for regional utilities and energy provision. However, these utilities are managed to accommodate region-wide growth and demand increase; these projects would be expected to fit within this long-term planning. Demand for utilities for all projects combined would not represent a substantial increase in demand for regional providers and would thus not be cumulatively significant. Utility delivery systems are expected to handle growth anticipated under LBNL's 1987 LRDP. LBNL, UC Berkeley, and the City of Berkeley all encourage or mandate water and energy saving devices and practices. Cumulative utilities impacts from the proposed project, in concert with development identified in this EIR at LBNL, the City of Berkeley, and the UC Berkeley campus, are expected to be less than significant.

SUMMARY OF IMPACTS AND MITIGATION MEASURES

As noted in the discussion above, under the 1987 LRDP EIR, as amended, with the incorporation of the proposed Mitigation Measures, the proposed project would not exceed the Standards of Significance established for utilities and service systems impacts.

The proposed project would incorporate 1987 LRDP EIR, as amended, Mitigation Measure III-M-1.

Potentially significant impacts not mitigated by 1987 LRDP EIR, as amended, mitigation measures: Building 49 Project-Specific Mitigation Measure L.1 is provided to reduce the potential construction impact to a less-than-significant level. As a result, no significant biological resources impacts would result from the proposed project.

Building 49 Project-Specific Mitigation Measures: See Mitigation Measure L.1 presented above.

[38] Since 1998, the U.S. Green Building Council has used the 64-point Leadership in Energy and Environmental Design (LEED) rating system to define "green building" for the design and building industry. 26 – 32 points are required on a building's scorecard to be certified; 33-38 points are required for a silver rating; 39 – 51 points are required for a gold rating; and 52 or more points are required for a platinum rating.